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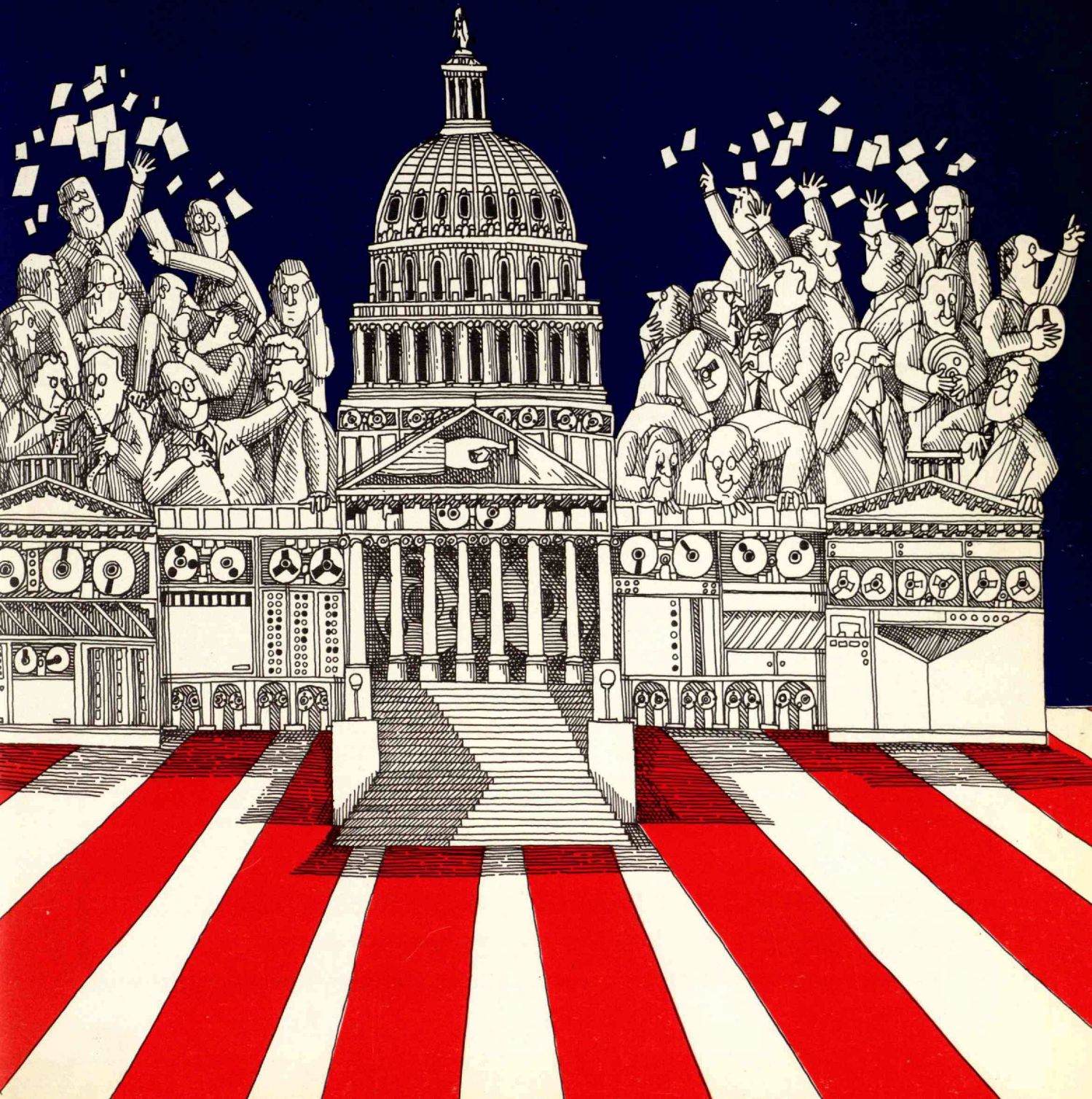
David M. Gates:  
Exploitation, Evolution and Ecology

George A. W. Boehm:  
Today's Crime Versus Yesterday's Technology



# Technology Review

John S. Saloma, 3d:  
The Presidency, the Congress and the  
Information Revolution



# technology review

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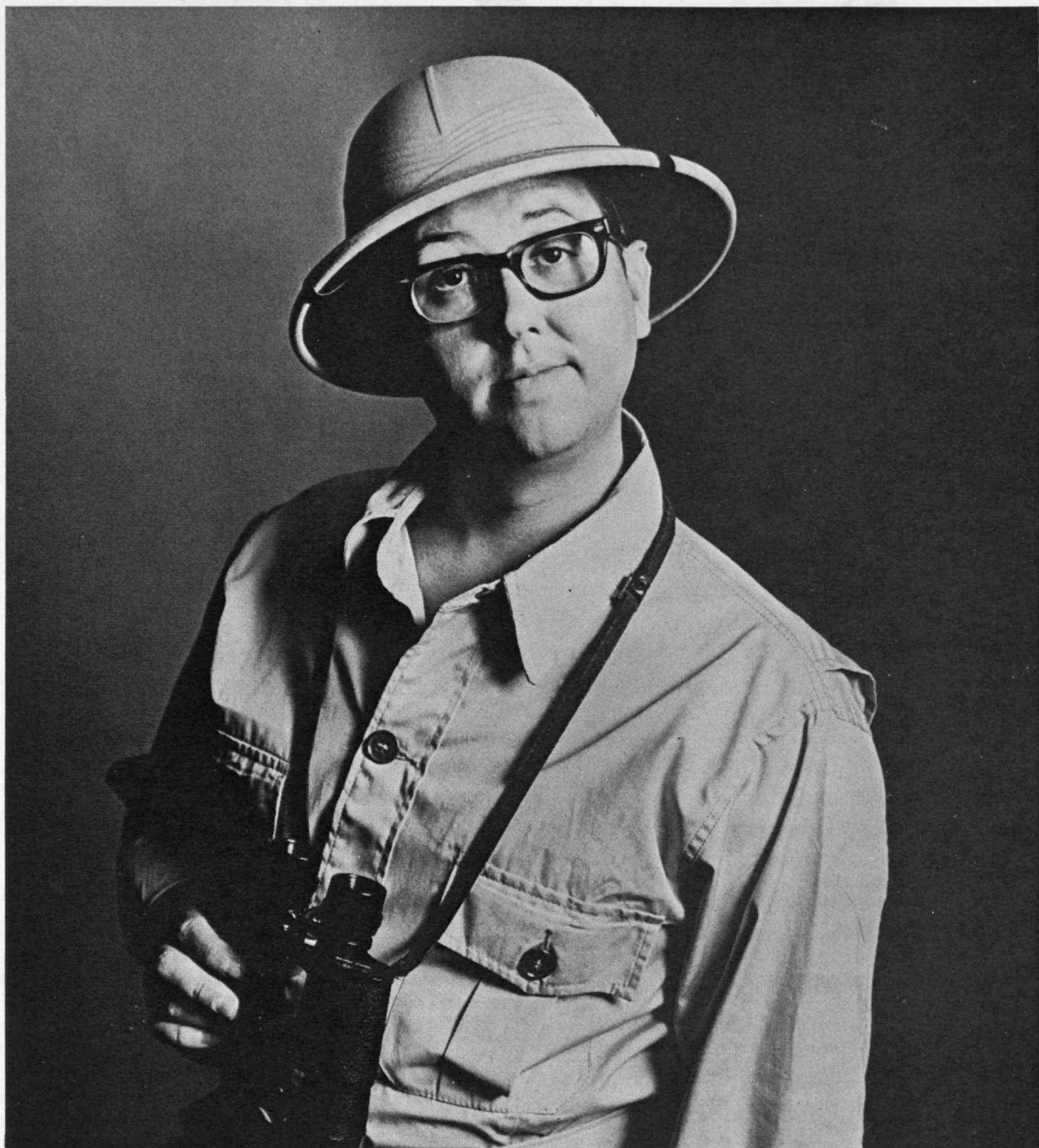
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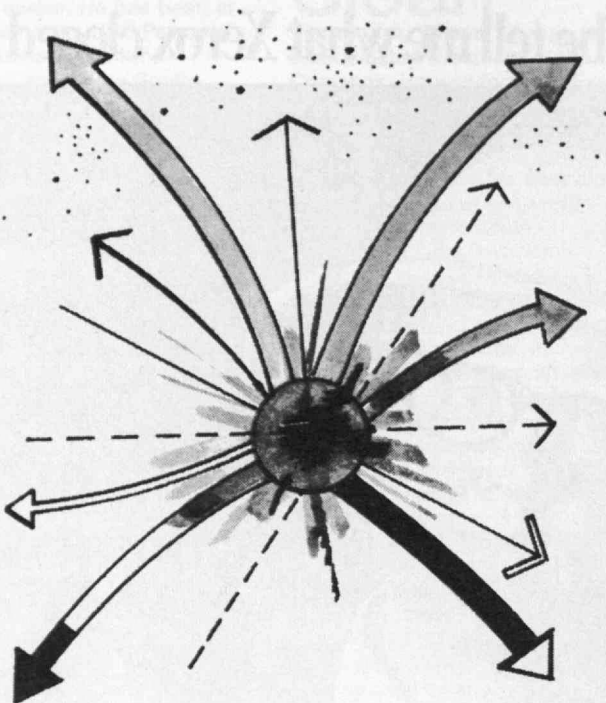
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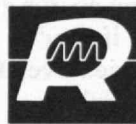
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#### Next month

In *Technology Review* for January, 1969:

If you think today's traffic is heavy, wait for tomorrow's, says Alexander Ganz, Lecturer in City and Regional Planning at M.I.T., reporting on a study of urban growth and future transportation patterns.

By the year 2000, the world's scientists may number three million. Our predictions of what they will then be doing, says Philip Morrison, Professor of Physics at M.I.T., can tell us a great deal about the strengths and weaknesses of science today.

Properly compacted, the yearly refuse accumulation of the 200 million people in the U.S. would occupy a cube 2,000 feet on a side. How we can reach this stage of sophistication in solid waste disposal, and what happens when we do, is the subject of David G. Wilson, Associate Professor of Mechanical Engineering at M.I.T.

#### The cover

Will modern computer technology turn Capitol Hill into a great new information system? Congress will resist, then let its committees and party leadership make some tentative experiments, and finally (by the mid-1970's) give all its members "free" access to a powerful computer-based system, says John S. Saloma, 3d, '56 (see page 22). The cover design is by Dill Cole of Eucalyptus Tree Studio, Baltimore, Md.

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Fighting Today's Crime with Yesterday's Technology  
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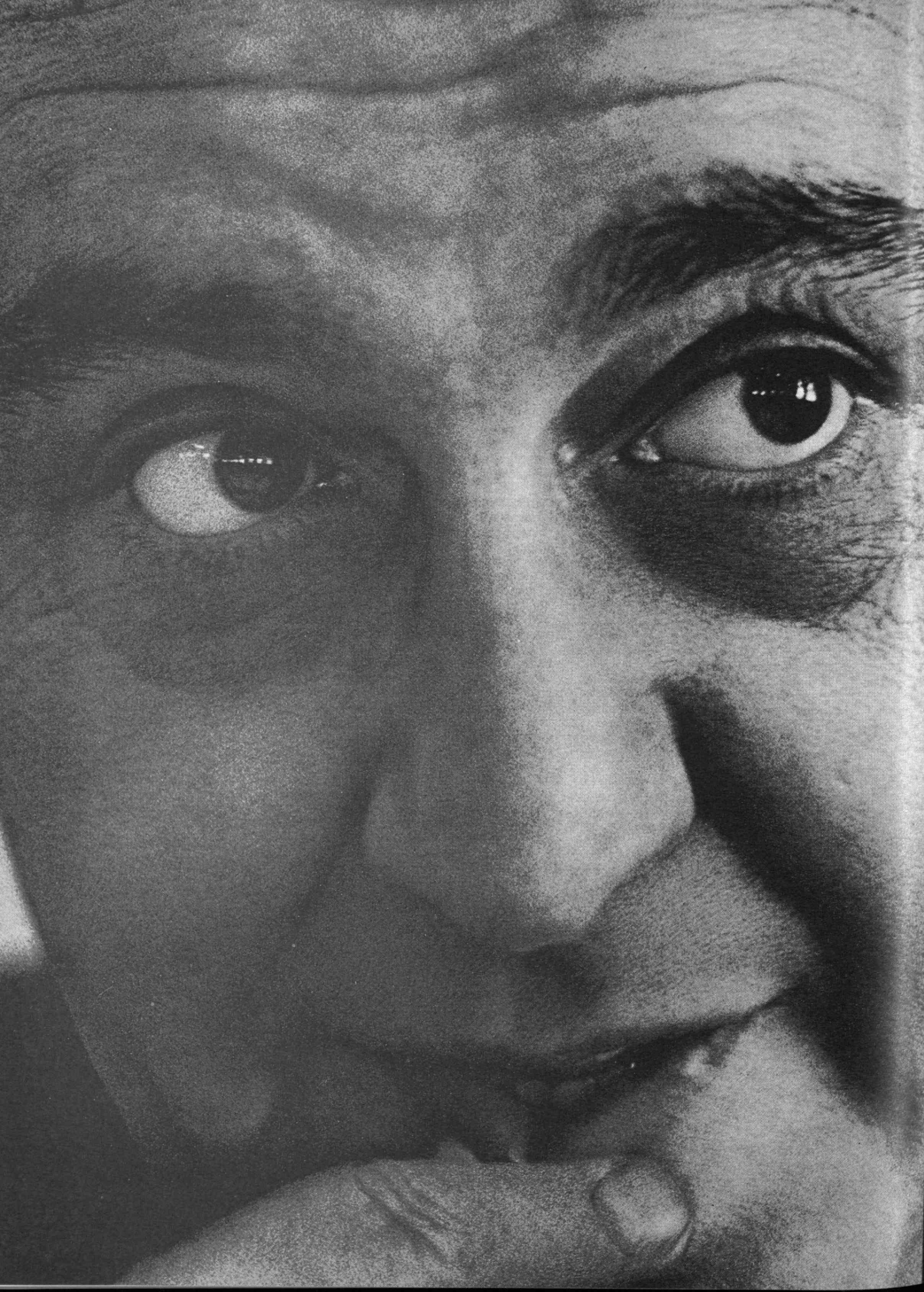
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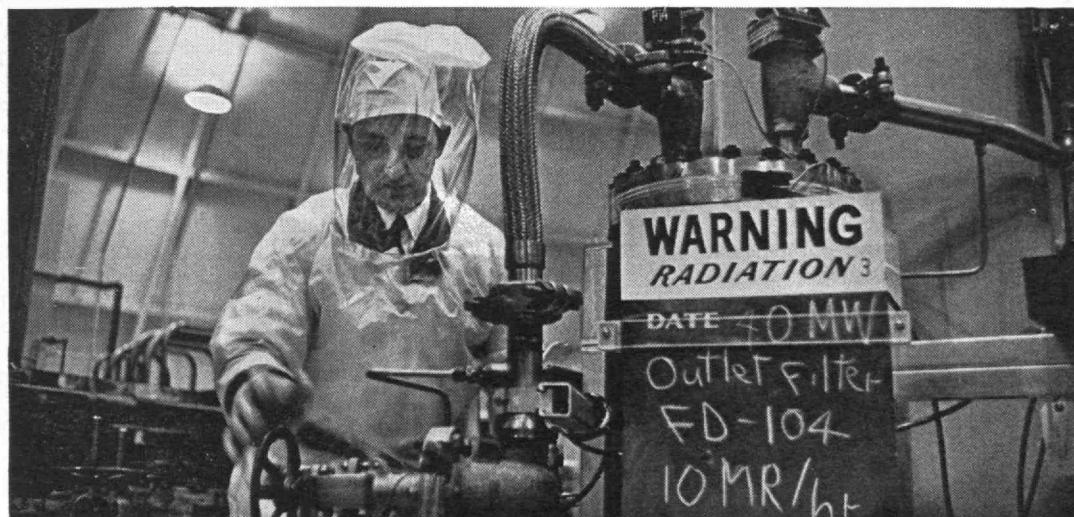
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Cordovi on an inspection tour of a nuclear reactor at Brookhaven National Laboratory. He spent 10 years there as a consultant on materials for various nuclear projects.



# Why Opt for Abstract Science?

As a reporter, I'm used to asking the questions. I wasn't expecting to be checked in mid-query recently when radio astronomer David Cudaback suddenly said he wanted to take over the interview for a while. We were talking about his studies of radio emissions from hydroxyl radicals in space. And he said I wasn't asking the right questions.

"We get money to pursue science only by returning something of value to the public," he observed. "I very much want to return something of value to the public. You should ask, 'Why am I working on hydroxyl radicals in space when people are starving?'"

It's the sort of question a lot of people are asking as research funds in the United States and many other countries run up against tightening national budgets. A field like astronomy sharpens the issue. For many people, it's an abstraction that has little bearing on their lives. At the same time, it's fairly expensive. I know astronomers don't think they get much of the cake. But there aren't many of them and their equipment can be expensive.

The U.S. Government spends something like \$50 million a year to enable them to do their thing. So the cost per scientist runs high. In radio astronomy, for example, the average investment over the past decade comes out to roughly a million dollars per active American radio astronomer, according to Robert Fleischer who heads the astronomy section of the National Science Foundation. That, Dr. Fleischer rightly points out, is a lot of money compared to sums available to the average scientist in other disciplines.

This is the kind of thing that nags at the Cudaback conscience. At the University of California at Berkeley, he's sharing in some of the most interesting of the astronomical research going on now. Among other things, hydroxyl radicals, along with neutral hydrogen atoms and helium atoms, emit a well-defined spectral line of radio energy instead of the scramble of wavelengths put out by most cosmic radio sources. They enable radio astronomers to do such things as measure velocities of gas move-

ments in space—because you can see Doppler shifts in these well-defined emission lines. Hydroxyl radicals have also raised the question of whether or not natural masers may be operating in space. And they are associated with the intriguing stars whose energy output is mostly at infrared wavelengths. Research of this kind leads an astronomer on with promises of new insight into the birth of stars or of the nature of galaxies.

But Dr. Cudaback wonders if, with the challenges we all face on earth, this kind of intellectual adventuring is really worth the million-dollar investment of public money he represents.

He noted, "There's the rationalization that there is something very important in the human spirit and that you have to feed that, too, even when there is a great need to feed human bodies. Maybe this is more important than merely satisfying physical hunger. And I do think we contribute to the human spirit in discovering and helping to explain the universe in which we live.

"If we take the long view of our world, we might solve our problems. And then how do we keep from being bored? This is what religions are about and it's important. Astronomy does have something in it to keep us from being bored. It takes a broad view of life and the universe. Perhaps there is someone out there to talk to. That's what keeps me going in this field. Even if we pull the plug on this planet, life may go on better elsewhere.

"Yet I wonder. I'm serious about this. The problems of the world are so big maybe we can't afford my belief. About nine in the evening when I'm home and tired I can't really convince myself we can afford to devote as much money and effort to astronomy as we do. You should come in here and ask me why I'm devoting myself to hydroxyl radicals in space when there's so much to be done on earth. It's a legitimate question these days."

## Whither the Best Minds?

So I have been asking astronomers about this when the occasion arises, and they have some interesting answers.

Gordon Stanley picked up the point while talking about the new 130-foot diameter radio telescope at the California Institute of Technology's Owens Valley Radio Observatory which he heads. This \$1.7-million instrument is only the first of what Mr. Stanley hopes will be a \$20-million, eight-dish array.

"Why invest in this?" Mr. Stanley asked. "It's a question I ask myself. International competition may not be a valid reason. The best argument I have is that radio astronomy tackles problems that often attract our best minds. Training graduate students, educating these first-rate minds, may be the best reason for what we're doing.

"It is true that astronomy is an abstract subject. To most people it may not seem too practical. We can argue its practicality as a way of developing precision measurement. But when I ask myself about this, the main justification I can see is simply that it attracts and educates the best minds because it's challenging and it's fun."

But shouldn't these superior minds be directed toward solving urgent problems on earth? "Perhaps they would be better employed that way," he said. "But you can't lead the best minds, can you? You can't direct such people. Exciting things are happening in astronomy. The unknown is there. You can ask me why should I personally be interested in it. I think I'm interested because it's fun. That's what life is all about.

"It doesn't mean you aren't concerned about other things. But the essence of science is that it has to be fun. You have to want to do it. You cannot plan these things where the best minds are concerned. No one has a grand plan for what we should do.

"On the other hand, if this kind of science ceases to be fun, to be largely a challenge for our best minds, it ceases to be worth doing. If it becomes 'big' science with large, expensive, highly directed projects and a lot of administration, then it loses its justification."

Dr. Fleischer, whose office has to put up

*Abstract science has its corporeal tools: this 130-foot radio telescope dedicated at the California Institute of Technology's Owens Valley Radio Observatory this fall will provide radio astronomers with new sensitivity for detecting and measuring minute celestial signals. It is the first in an interferometry array of eight radio telescopes which are planned at the site; when completed, this plan will result in the world's most powerful and flexible radio observatory for the study of radio sources in and beyond our own galaxy.*

much of the money that lets Mr. Stanley have his fun, shares this appreciation of astronomy as a training ground for intelligence. But he is less reticent about its practical implications.

In dedicating the new 130-foot dish last October, he remarked that radio astronomy research on extragalactic nebulae "may not bear directly and obviously on problems of transportation in crowded cities, but the interconnection is there and it can be traced. The chain from the astronomy department through the physics department to the mechanical engineering department, and thence to management engineering and the school of public affairs, is not that terribly long."

He did add that the benefits of astronomy "are in part spiritual ones. Scientific research is an ingredient of modern civilization."

#### **True Relevance in the Long View**

Here Dr. Fleischer sums up what I feel to be astronomy's real justification for its cost. Our world is a science-based world. Many people feel lost in it, threatened by it. Their world view somehow doesn't mesh with the realities of a scientific-technological age. Yet of all the sciences, the grand, magnificent view of the universe we are gaining from astronomy does reach people. It does help orient their thinking. It helps them to fit what we are learning about earth and earthly life into a cosmic pattern.

People are hungry for this. As a science writer, I find astronomy a subject of high interest for a wide spectrum of readers, many with very little scientific education—or very little education at all. Surveys taken for the National Association of Science Writers have found this interest. Medicine has the greatest reader interest among science-based subjects, according to the surveys. But astronomy runs closely behind.

This is the spiritual hunger Dr. Cudaback has in mind and which he talks of feeding. Indeed, most astronomers come down to this when justifying their work. Britain's Astronomer Royal, Sir Richard Woolley, expressed it eloquently in a

simile with music when I put Dr. Cudaback's question to him earlier this year.

Scientists doing basic research, Sir Richard said, "are taking part in a wide-ranging intellectual adventure that is an important part of society's activities. There's a strong parallel with music. Those countries and those times which produce great music and great musicians are those that foster such things, that appreciate them and support them.

"Great music or great science is done by men and women who have the leisure to do it or who have a sympathetic public. They can't do it in isolation from society. In the 'advanced' countries, these conditions have prevailed and produced vigorous science. In backward countries science hasn't had the opportunity to grow this way. The only basic requirement for having first-rate science and first-rate scientists is for a first-rate man to be able to choose to do science."

Referring to those who fear technology and science as some kind of personal threat or who want to see a quick practical return on research, he added, "We just don't care. Many people don't like great music. Are composers going to stop composing? Are orchestras going to stop playing?"

"If you feel it's more important to make two blades of corn grow where one grew before, you won't go in for abstract science. But if you think that man should also think, and think deeply, about himself and the universe, in every age, then you may well opt for abstract science. You'll say, 'I'll do that. I'll earn my bread with science. I'll take part in that phase of man's activities.'

"Look, I'll answer your question this way: What good would it have done for Johann Sebastian Bach to stop writing fugues and try to do something about social conditions in Eighteenth Century Leipzig?"

*Robert C. Cowen, '49, is Science Editor of The Christian Science Monitor; he is a Past President of the National Association of Science Writers.*





# Can Scientific Unpredictability Become Public Policy?

American scientists have some difficult lobbying ahead of them. In the next few years, they are likely to find themselves working hard to elevate the unpredictability of scientific results into a public policy.

As they compete for funds liberated by a gradual slowing of the Vietnam war, scientists will not be able to make the specific claims that their work will assure military defense or the alleviation of human disease or the enhancement of national prestige through triumphs in space with the same force as before. They will have to point out that the specific goal of a manned landing on the moon by the end of 1969 may well have diverted funds and talent away from more scientific aspects of space exploration and from other valuable research. They will oppose the use of funds for the development of new weapons systems, and—by fortunate coincidence—they will be doing so to the same Department of Defense managers who are now staggered by the mounting cost of each new commitment.

For many years, research in biology and medicine has been "sold" as a pathway toward curing the key health problems of a population which lives longer: heart disease and cancer. This approach has yielded much money from a compassionate Congress—sometimes too much money—but it has brought with it a commensurate disappointment. Cures for the problems of aging seem to recede into the distance. Much of the work has concerned problems such as the reproduction of viruses—and these seem very remote from human concerns. And some of the therapy developed, such as heart transplants or kidney dialysis machines, arouses deep ethical concerns about a policy of prolonging the lives of people into an old age where they have no secure social function, no place in family affections or in the marketplace.

Selling science as relevant to specific social concerns, then, has become risky. Furthermore, the tremendous elaboration of the scientific community during the past 20 years also makes it difficult to lobby on its behalf by advertising a few specific goals. More general justifications have to be sought.

## Basic Science and Economic Growth

The most important of these is that the vigor and range of a nation's scientific effort is directly linked to its continued economic expansion. This is the argument being made when Donald F. Hornig, science adviser to the outgoing President, asserts that about half of all real growth in the American economy results from new technological input; or when M.I.T. Provost Jerome B. Wiesner warns that hold-downs in the U.S. government's scientific spending during the past five years could mean a technologically sick economy five years from now. And this, he says, means that the U.S. may be less able to compete in world markets or to support the dollar as a reserve currency for such all-important tasks as the development of poor nations.

This is an important argument. But the argument of economic strength has many components, and it opens the door to many other claimants. Is there any provable relationship between economic growth a decade hence and expenditures now on a new bubble chamber for the Alternating Gradient Synchrotron at Brookhaven or a 440-foot fully-steerable radio astronomy antenna?

The only answer that the scientific community can give is that the relation is indirect and unprovable—that politicians must take it on faith that generosity towards the scientific community (which includes generosity towards a large number of people doing foolish research along with, we hope, an even larger number doing important work) has produced much of our present prosperity and will be central to its maintenance. The idea is that some of what now appears to be a chaotic mass of noise will later resolve into a loud, clear sound.

This is the argument so often made in Europe by Victor F. Weisskopf, now Head of M.I.T.'s Physics Department, when he was Director-General of the European Organization for Nuclear Research (CERN) and lobbying for the commitment of funds to build the 300-billion-electron-volt proton synchrotron which may go ahead in the next few years. Research in nuclear physics,

Professor Weisskopf noted, eventually opened vast new industries, new worlds of a sort that the "Italian navigator," Christopher Columbus, never dreamed of. The same sort of thing may eventually come from research on forces within the nucleus of the atom, Professor Weisskopf argues.

This is the same sort of argument being made these days by Frank Drake, the Director of the Arecibo Ionospheric Observatory in Puerto Rico, who is one of the leading students of the puzzling new emitters of radio pulses called pulsars.

The first year of research on these objects, Dr. Drake says, has led to the conclusion that they can only be the long-postulated but never observed neutron stars—stars which are, so to speak, near death and in which matter is packed so densely that the star is essentially one huge atomic nucleus.

Dr. Drake asserts that pulsars are perhaps 10 miles across. The apparent power of their radio emissions, however, is such that each square inch of the surface must emit energy equal to the total power generation of all the world's power stations, 10 thousand billion billion watts. If an object that size is to emit the power we observe, it must utilize a mechanism of power generation of great importance for mankind to understand.

## The Special Privileges of Science

Such arguments for building large new instruments for research in the physical sciences ask a great deal of a politician. The exact nature of the material payoff from such research cannot be predicted, nor is it easy to predict how quickly it will come. Some 50 years elapsed between the work of Faraday and practical large-scale systems for electric power (providing the tax revenue that Faraday predicted would one day accrue from his work on generators). More than 40 years intervened between the discovery of nuclear radiation in the 1890's and the discovery of nuclear fission in 1938. Only a few years before this achievement, Lord Rutherford strongly affirmed that practical applications of nuclear physics were unlikely. During the 40-year span there were nine Presidents of the United

States, 10 Prime Ministers of Great Britain and heaven knows how many Premiers of France.

But the argument in favor of a long view of technological questions is not completely unfamiliar. Both businessmen and politicians have begun thinking about long-term conservation of natural resources for future generations. This is a type of attitude that could aid in making policy for science.

There is an important additional risk in making such arguments, however—the risk that scientists will appear to be asking special privileges and money for a sort of Twentieth Century priesthood which is not interested in immediate human problems.

The counterargument is another broad assertion: that without a strong effort in undirected, untrammeled fundamental research, open to all the swiftly changing fashions of an irreverent international fraternity, major social goals cannot be achieved.

Nothing shows this more clearly than the 25-year-old Rockefeller Foundation effort to raise grain yields around the world. The program began in Mexico in 1943 after a feasibility study conducted by just three men. It has since spread all over Latin America, then to India and lately to Southeast Asia.

The effort has always been firmly allied to basic research on grain genetics, even including some semiarchaeological research on the domestication of maize in middle America. It has rejected the argument that poor nations must eschew fundamental research during their great crises. Instead, there has been continued emphasis on creation of an apparatus for basic agricultural research, including agricultural universities in underdeveloped countries like Mexico, India and the Philippines.

It can be said fairly that this pioneering program, originally suggested by Vice President Henry A. Wallace (himself a corn-breeder who became Secretary of Agriculture like his father before him), has brought mankind to the edge of a solution to the calorie part of the food problem. The program was slow, it was rigorous, and it was conducted without much rhetoric about how science must be compassionate. While others spoke of the inhumanity of science, this Rockefeller Foundation program quietly demonstrated the opposite—and at a total cost under \$100 million. In no sense can it be said that any other technological commitment, to nuclear bombs or to moon flights or to cancer cures, has interfered with this centrally important program.

In their lobbying with the incoming Nixon administration, elected on a narrower and more liberal mandate than most observers had expected, the scientific community will have to stress that such programs take a long time to show their

full benefits, even though there may be some short-term payoffs such as a doubling of Mexican grain yields in 15 years.

This is a preferable tactic to lush promises of quick returns, like those made about the space program, which can appear to be illusory even if they aren't.

#### **A "Morning After" for Marine Science?**

The risks of such promises have been illustrated lately in the field of marine science, which is a bit overloaded with equipment and undersupplied with first-class intellectual laboratories on land. Many rosy promises have been made about the marine resources that might swiftly be tapped as the results of marine research.

To be sure, geological studies of continental shelves have begun to point to heavily sedimented areas where oil deposits may lie, even though adjacent formations on land are known not to be promising. Such areas are around Australia and along the Atlantic seaboard of the United States, where oil companies have just begun extensive coring from survey vessels. Something like a sixth of the world's petroleum comes from off-shore areas already, but most of it comes from places near extensive commercial deposits on land.

Harvests of ocean fish have doubled in the past decade, reinforcing often-made predictions that a solution to world protein shortages might lie in the oceans. But the contribution of fish to world food supplies is still small and even were the total catch to quintuple (the highest expectation now thought to be reasonable) the share would remain small.

A similar situation exists for sea-floor minerals such as manganese or sulphur or phosphates. The projections of cumulative demand for these substances do not show exhaustion of land-based supplies at today's prices until the 1990's. If exploitation of sea-floor supplies raises costs to 50 per cent more than today's prices, which is almost certain, still more underground deposits would be economic for commercial exploitation before marine deposits were used. It may be that the main near-term justification for development work on mining sea-floor minerals will be to aid in reducing the price of mining on land.

It was a significant sign of political sophistication in the scientific community that these arguments were heavily stressed at a conference in Newport, Rhode Island, last July. The conference was deliberately designed to knock the stars out of a lot of eyes. Scientists at the conference made it very plain that they don't want the sort of "morning after" that their space-research colleagues have been facing even before the goal of a lunar landing has been achieved.

#### **Science: Surprise Is Routine**

In such a world, it is better for scientists to talk frankly to their political patrons about the unpredictability of what they are doing. One intriguing formulation of this idea has been published recently by Charles H. Townes, former M.I.T. Provost:

"Americans are intensely practical, and it is difficult to accept the idea that a result is not best achieved by systematic planning, keeping one's eye on the ball and good hard work.

"But we have all too frequently had the experience that in judging the practical value of specific scientific research, and in certain cases even of engineering development, those who would seem to be most knowledgeable and responsible are not able to foresee the most imaginative and important steps.

"History shows this in many more cases than quantum electronics. In fact, surprise in the development of technology is our regular fare."

It should be a comfort to politicians to know that mankind is not bound in a scientific and technological strait-jacket.

*Victor K. McElheny is Science Editor of the Boston Globe and was formerly European representative of Science magazine.*

# White Paper Time... But Beware Of the Status Quo

It's White Paper time in England. Britons write beautiful White Papers—clear, concise White Papers—meaningful, important White Papers. Carefully selected committees critically examine segments of British life; compare and contrast their way to that of others; shrewdly deduce all their major and minor difficulties; devise sweeping, constructive solutions; and submit a well-prepared *fait accompli* to the appropriate Minister or the Prime Minister who presents it to Parliament as the expression or decision of the Government.

## British Practice and the Brain Drain

One such White Paper, the Jones Report on "The Brain Drain," was presented to Parliament in October, 1967. The report is a penetrating analysis of what is obviously an undesirable situation. It is shown that the causes of the brain drain lie at all levels in government, industry and the universities, although the bulk of the problem is simply due to British industrial practices. The report concludes that the brain drain has reached serious proportions; that the proper solution is to create more challenging opportunities, particularly in industry, for talented people; that to do this will require a high and sustained level of industrial investment and greater recognition that industry is the source of national wealth and that new ideas must be commercially exploited in order to create wealth. The report notes that to achieve these aims will require a redirection of the national research and development effort, more effective long-term planning of government-financed projects and the provision of adequate risk capital.

Regarding the use of people, the report suggests that greater mobility between employments is essential, that pensions should be made transferable, that professional managerial training is a must, that there should be a deliberate national policy of higher pay for talented people, and that technically trained people should play a more significant role in the formulation of company policy and objectives. The report also recommends that universities should reverse the current tendency to train scientists towards academic achievement

as an end in itself and redirect the emphasis of education towards the needs of manufacturing industry; that universities should recognize industrial work for advanced degrees; and that there should be part-time exchanges of personnel at all levels of industry and universities.

The brain drain to the U.S. recently came to a grinding halt—not because Great Britain had responded wholeheartedly to the suggestions of the Jones Report, but because the immigration law of the U.S. had been changed. But let us first see how much had been achieved prior to that time.

## Maximizing the Frustrations

Industrial employment in Britain is very much a get-in-line-and-wait procedure. One is expected to stay for life with the company that has hired him and the company plans on it, too. One advances very slowly through the ranks only as older men retire or are removed by nature. Responsibility and challenge are not achieved for many years. Salary is determined strictly by age; talent and achievement usually result only in grumbling from your colleagues and nervousness in your boss. To recognize talent and achievement by promotion and salary increases would be to destroy the entire system. Mobility is held down by the lack of a national or transferable pension scheme.

The cult of the amateur is dominant in schooling, university and industry in Britain. It is still not openly admitted in many universities that one has actually prepared an assignment or studied for an examination. This attitude has been carried over into business and industry such that until very recently management training was virtually unknown. When the first U.S.-trained management graduates were approached, the British companies were frightened away by the size of the salary expected and the scope of the position desired: both were too much for staid industries to concede to new graduates. The same amateur attitude is exemplified by many science-based firms whose boards of directors do not contain any technically trained people, by the civil service and Parliament, and by the large number of small engineer-

ing firms who do not possess a single graduate engineer.

University professors, even in the sciences, have never held the confidence of business and industry; consulting contacts are virtually unknown and made difficult by a holier-than-thou attitude on both sides. It is no wonder, then, that technical education tends toward science and the sciences toward higher purity. In this way the gulf between university and industry is maximized; this also assures that any new graduates seeking industrial employment will be put off by the 'strange' ideas of industry and continue their tenure at the university—perpetuating the problem.

There are also substantial problems associated with securing support for impure research in universities, finding private risk capital, and generally convincing people that there is virtue in seeking to create wealth rather than in its distribution and consumption. But it is perhaps more fruitful to look at another aspect instead: the flow of students into science and technology places in the university. This was the subject of the Dainton Report published in February, 1968.

## How to Multiply Scientists

The investigation of the Dainton Committee showed clearly that the number of science students entering universities is not rising as rapidly as is the number of students opting for arts and social studies. This shift is obviously of great concern in a land much in need of rapid technological progress—one which has prepared her universities to receive a quickly increasing number of science students.

The first recommendation in the report is to keep sixth-form education as broad as possible, avoiding specialization (the sixth form is senior secondary schooling, taken at age 16-18, roughly equivalent to finishing one year of college in the U.S.). This recommendation is made to allow students to opt for science right up to the time of university entrance. It is simultaneously recommended that university entrance requirements be amended to allow a broad span of sixth-form study.



The Committee recognizes that these changes could aggravate the shift. However, this does defer the age of choice by a year or more, to a time when the students will presumably have achieved greater maturity. This change also implies the continued study of mathematics, a key subject in maintaining flexibility, for all sixth-form students.

The second broad recommendation is to stop trying to make science and technology *appear* more attractive and to take positive steps to make them *become* more attractive. This includes bringing pupils into early contact with good science teaching of science curricula into which have been infused breadth, humanity, up-to-dateness, and relevance. To accomplish this will require the complete renovation of many existing science teachers; the redeployment of present staff to ensure that younger, uncommitted pupils have quality instruction; and the recruitment into teaching of more university science graduates—by the use of positive incentives.

The enormity of these suggestions must be emphasized. This report is recommending a countrywide broadening of the educational base of the last two years of high school, two additional years of mathematics study, and a revision of university entrance requirements which would probably require changing the whole undergraduate scheme from three to four years.

I really do not need to tell you how these ideas were received. One of the fastest reactions was that of the National Union of Teachers to the suggestion that science teachers should be paid more ("positive incentives") than others. Such an idea does not go down well in a socialist country where all teachers are paid on the same (Burnham) scale. Another immediate reaction was to the mathematics-for-all suggestion; the short supply of qualified teachers makes this difficult. Perhaps a better suggestion was to use the extra time to give meaning to that supposedly already learned. And the universities? They have maintained a stony silence.

#### Flexibility vs. Specialization

In September, 1968, came the Swann Report, in which the employment of scientists, engineers and technologists was considered. This report echoed some of the recommendations of earlier reports regarding science teaching in the schools and the pay of science teachers relative to others, the general lack of employment mobility between government, industry and university—and then dropped several of its own bombshells.

The Swann Report recognizes publicly for the first time that British first-degree courses in science and technology are too highly specialized, that the specialization becomes even more accentuated in graduate work—and that such education is not sufficiently widely based to meet the longer-term needs of the in-

dividual or his employer. It is also recognized in the report that the British scheme of doctorate training (consisting only of research, but no advanced courses) is not closely geared to the needs of the economy and that continuation of this scheme could lead to increased employment dissatisfaction and emigration. It is further recognized that the current pattern of deployment and utilization of Ph.D.'s must be broadened to make their talents available, not simply in research and development, but also in manufacturing, production, administration and management. To do this most satisfactorily, though, will also require changes in the Ph.D. training program to broaden its scope and to match it more closely to the needs of industrial employment. This report also recognizes (probably for the first time in British history) the value to industry of training or degrees above the level of the first degree (but less than the Ph.D.) and the need for short courses spread throughout one's life.

It's really too early to expect any action to have been taken in this regard, but we can consider the comments of the press. The *Times* (September 25, 1968) generally agrees that "scarce talent commands more money" and that graduate study should be more flexible. But, when the question of broader undergraduate training is considered, the *Times* takes the older British attitude that 'more means worse' and cautions on the question of standards:

"The intrinsic quality of British scientific training is involved, and there is some evidence that the more rigorous a training is, the more likely it is to attract the best students. This is why great care must be taken about broadening the first-degree course. In principle broadening is admirable so long as it does not mean giving the student a smattering of too many subjects when what he needs above all at that stage is some study in depth to develop his powers. One's fears are aroused, therefore, by references to 'relevant study in other fields such as economics, sociology, law, etc.' We do need general scientists with a range of scientific disciplines, but we do not need scientists with a smattering of the social sciences disciplines."

This is a short-sighted approach, I think, reflecting the philosophy that scientists should stick to science and that managers are born, not made.

The *Guardian* leader (editorial, September 25, 1968) agrees with all that the Swann Committee has said—but comes up pessimistic because of the number of sacred cows involved: "All we need is a revolution in two of the most conservative areas in British life, incomes bargaining and the structure of education."

John Davy, writing in the *Observer* (September 29, 1968), devoted an entire column to the "obvious point, long recognized in the United States but largely ignored in Britain, that specializa-

tion easily leads to fossilization. The faster the pace of change, the sooner the specialist's skill is out of date." Davy examined the attributes and virtues of a 'generalist' in the sciences and concluded that with the present scheme of science education "... we either produce inflexible specialists whose main motive is to seek professional security in some narrow field by becoming an 'authority,' or rebels who swing from science or indeed from a technological society as such. But most serious of all, we risk making education serve an abstraction—'society'—instead of the individuals who comprise it.

"This is why the diagnoses and recommendations of the Swann and Dainton committees are so important. They have correctly perceived a serious disease of British higher education, a kind of narrowing and hardening of the arteries which is having very profound effects throughout society. And their recommendations are not merely a recipe for tackling an immediate practical problem (the supply of scientists). They are concerned with reforms which could in due course have quite surprisingly far-reaching and positive social effects."

*Nature* (September 28, 1968) produced a surprisingly mushy editorial, but *New Scientist* (September 26, 1968) squarely hit the mark. Commenting on the three reports we have just reviewed on the flow of scientists, engineers, and technologists the *New Scientist* leader stated that: "All the evidence links and interlinks, but so far it is difficult to find any major government action on any of it, however authoritative the authors of the reports may be and however depressing the picture they reveal.

"Yet there are some rewards. Today no Minister, industrialist, university don, or man in the street can take refuge in optimism supported by lack of information and, to be cynical, we must by now have exhausted the principle of appointing investigating committees as an alternative to action."

Yes, Britons write beautiful White Papers—clear, concise White Papers—meaningful, important White Papers. And then? And then they are quietly put aside—ne'er to be mentioned again until the next round of committees begin to do their homework. What? Act on them!! Certainly not, mate—might disturb the *status quo*, you know.

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# The Many Faces of the Scientific Temperament

Biography is not history written small. It is unreasonable to require in both the same degree of order and definition, for people's lives occupy more than the four dimensions of the familiar continuum in which events occur. We should be content if the biographer's work provides a context in which we may understand his people in relation to their times and to us. Unexpectedly, *Einstein on Peace* (New York: Schocken, 704 pp., \$10), edited by Otto Nathan and Heinz Norden, a collection of writings, is more successful than *Lawrence and Oppenheimer* (New York: Simon and Schuster, 384 pp., \$7.50), by Nuell Pharr Davis, a narrative account with accomplishments that underline its failures.

Ernest Orlando Lawrence, 27, and Julius Robert Oppenheimer, 24, arrived in California within a few months of each other. Mr. Davis' narrative begins there, and from it flows a clear view of the excitement of physics and of being a physicist before and during World War II. He traces the development of the cyclotron by Lawrence, the growth of understanding of the structure of the atom, the discovery of nuclear fission, and the construction of the atomic bomb under Oppenheimer at Los Alamos while Lawrence continued to build huge electromagnetic machines, and to plan even larger ones, at his own Radiation Laboratory, at Oak Ridge, and elsewhere.

The history of Los Alamos has been told before, but not from a perspective so close to Oppenheimer's. Mr. Davis conveys vividly and credibly Oppenheimer's role as Director in recruiting leading scientists; persuading these individualists to work together; providing for their families in the lonely, remote Laboratory site; establishing, enforcing, and sometimes evading security regulations; and above all, meeting research deadlines as if invention and ingenuity could be called up at will.

The story moves quickly from the successful test and unhappy use of the bombs to the disagreement over embarking on the hydrogen bomb and finally to the Atomic Energy Commission hearing that Oppenheimer requested when his security clearance was revoked. The transcript of that hearing, contain-

ing Oppenheimer's devastatingly honest autobiography, has attracted at least one playwright. Read silently, so many years later, it is still remarkably dramatic.

## Toward the Anticlimactic Encounter

But the drama does not carry over to the final and declining portion of the book. Mr. Davis is not impartial, nor need he be. In the postwar controversies he is for Oppenheimer, for the end of atomic secrecy, for international control of nuclear energy. He is scrupulously objective about Lawrence, but clearly finds him unattractive. He is against Edward Teller, against the dropping of the first bombs, against building a hydrogen bomb, against the A.E.C.'s charges and methods in the hearing. But unfortunately he becomes involved in arguing minor, legalistic details. It was evident, even in 1954, that the hearing was a ritual performed for a pre-ordained end. A mountain of testimony brought forth a mouse of a conclusion: Oppenheimer was undeniably loyal, but he was certainly untrustworthy.

It is also unfortunate that history denied Mr. Davis the ultimate confrontation implied in the title of his book. Lawrence and Oppenheimer seem to have liked each other when they met as young men at Berkeley. Experimentalist and theoretician, each one's scientific interests complemented the others'. They talked, walked, took part in campus social life. "Quite a guy," Oppenheimer said of Lawrence. "Between us was always the distance of different temperaments. But even so, we were very close."

After 1945, it was inevitable that Lawrence, a Nobelist, and Oppenheimer, now also a statesman of science, should be among the relatively small number of men influential in determining national science policy. Predictably, they disagreed, sometimes about Lawrence's projects or causes, such as his proposed giant accelerator for the production of plutonium, the hydrogen bomb, and the establishment of Livermore Laboratory with Teller as Director. Lawrence came into conflict with other physicists, who were ready for public or private quarrels; but the book records no expression of emotion by Oppenheimer more violent than "mild melancholy." "There was a

time," he is reported to have said, "when Ernest liked to listen to theoretical physicists. Now he doesn't seem to listen to them any more."

Lawrence started to Washington from Berkeley in order to testify against Oppenheimer at the A.E.C. hearing, but he turned back because of the illness from which he died a few years later. So the final dramatic encounter toward which the author aimed his story never took place.

Even if the two men had faced each other in that hearing room, however, the meeting would have been anticlimactic. It is not true, as the book's jacket claims, and Mr. Davis implies, that their "... association began in productive harmony ... and ended in rancor that split the nation's scientific community and swayed the entire course of United States atomic policy." Events were determined by far more complex causes. And there was between them little feeling, friendly or rancorous, but "always the distance of different temperaments."

Mr. Davis has drawn not only on printed matter but also on "the memories of my two subjects told me by about a hundred of their associates, mostly physicists." Quotation marks, enclosing a wealth of original source material, are as abundant as in the pages of a novel of the old school. Yet this energetic achievement leads to a serious lack. For example, " 'Privately, Fermi ridiculed Lawrence's whole idea of the calutron,' said Allison." Does this tell us something about Fermi? Lawrence? Allison? The calutron?

" 'Robert [Oppenheimer] could make people feel they were fools,' said Bethe. 'He made me, but I didn't mind. Lawrence did. The two disagreed while they were both at Berkeley. I think Robert would give Lawrence a feeling he didn't know physics, and since that is what cyclotrons are for, Lawrence didn't like it.' " Is Bethe grinding an axe? Or is this really so? At least, what is the likelihood that it is so?

## Questions Not Asked

We are not told but are given the raw data, unevaluated and unassimilated, as

if their totality constitutes biography. Consequently, the most interesting questions, for the sake of which the biographer writes and we are moved to read, are not asked. How did Lawrence come to win a Nobel prize? Why did Oppenheimer, a universally acknowledged genius, never receive one? What made Oppenheimer, the introverted and detached man, capable of managing the Los Alamos Laboratory so effectively? We may question, even if the author does not. We may even venture answers.

It is well known that Nobel prizes are awarded for achievements that differ widely in scope and magnitude. In physics, another variable is introduced by the existence of two types of awards; for a new concept or a body of work that enlarges fundamental knowledge; or for a new instrument useful in adding to the store of knowledge. Examples of the latter are the prizes to Wilson for the cloud chamber, to Glaser for the bubble chamber, and to Lawrence for the cyclotron. The invention of this machine was Lawrence's only significant contribution to physics.

Oppenheimer was not an experimentalist, nor was he in the first rank among contemporary theorists that included Bohr, Fermi, Einstein, von Neumann, Wigner, Szilard. He was essentially a teacher, an unusual teacher who trained a generation of physicists. It is a rarer, more important achievement than many for which the prize has been given, but it does not fall into any category considered by Nobel committees.

On the other hand, if it is understood that the quality of a teacher is measured by his ability to elicit from individuals more than they were aware they could accomplish, then it is apparent why the particular genius of an Oppenheimer made possible the fulfillment of the Los Alamos mission.

We require of the biographer a frame of reference within which the broadest questions may be asked and answered. We want a metaphor that illuminates his subject against the background of his time and ours. How can we look at these two men so as to grasp them whole and all at once?

#### **Poor Billy Budd!**

Lawrence fits easily into a cultural pattern instantly recognizable. He was the protégé of rich men, the friend of influential ones. From the former he could have, for the asking, money for a new laboratory; from the latter, government support for projects other scientists believed impractical. He played students, colleagues, and universities against each other in the furtherance of his career. Melvin Price, a member of the Joint Congressional Committee on Atomic Energy, said of him, "He was an operator, a promoter, a salesman."

So he was, and it is useful to see him in this way, provided we remember that he was other things besides.

And Oppenheimer? Until he was past 30, he was by his own account divorced from the life of the country. "I never read a newspaper or a current magazine. . . . I had no radio, no telephone; I learned of the stockmarket crash in the fall of 1929 only long after the event; the first time I ever voted was in the presidential election of 1936." Then, still innocent and filled with compassion for the poor and the persecuted, he joined organizations—and some of them were Communist dominated. Later, at Los Alamos, he was silent or evasive about approaches made to him and others for secret information. He was handsome, loved by his students, admired by his elders. (According to I. I. Rabi, "When he showed up in San Francisco, crowds gathered on the pavement around him.") Yet he was also hated, and in the end he was punished for acts he did not intend but could not deny.

The archetype emerges. It is Melville's Billy Budd. "Noble descent was as evident in him as in a blood horse." "He was illiterate. He could not read, but he could sing . . ." When he was solicited by a treacherous shipmate to join a mutiny, he refused, but "it never entered his mind that here was matter, which . . . it was his duty . . . to report in the proper quarter. And probably, had such a step been suggested to him, he would have been deterred from taking it by the thought . . . that it would savor overmuch of the dirty work of a tell-tale."

Good, sweet of spirit, and innocent, loved and hated for being what he could not help being, punished for a wrong he did not mean to commit—poor Billy Budd!

#### **Full-time Scientist, Part-time Saint**

*Einstein on Peace*, a new edition of a book first published in 1960, consists of excerpts from articles, letters, and speeches written between 1914 and his death in 1955. In small type, the editors interspersed notes on dates and other circumstances that provide a setting.

The causes for which Einstein worked all his life were civil liberties, democracy, socialism, a secure Jewish homeland, social and economic justice—and peace. "My pacifism is an instinctive feeling, a feeling that possesses me; the thought of murdering another human being is abhorrent to me. My attitude is not the result of an intellectual theory but is caused by a deep antipathy to every kind of cruelty and hatred."

He believed that peace was impossible as long as there were sovereign states with the power to wage war; the only hope was a strong world government. In the meantime, however, a pacifist had other obligations. When asked in 1929 what he would do if another war broke out, he answered: "I would unconditionally refuse all war service, direct or indirect, and would seek to persuade my friends to adopt the same position, regardless of how I might feel about the causes of any particular war."

He was in the United States on a visit on January 30, 1933, when Hitler came to power; he did not return to Germany. He remained "as ardent a pacifist as ever before," but since the world situation had changed, he no longer felt justified in "advising a Frenchman or a Belgian to refuse military service in the face of German rearmament." Almost 20 years later, he stated his position again: "I am indeed a pacifist, but not a pacifist at any price. . . . I would individually and collectively resist violently any attempt to kill me or to take away from me, or my people, the basic means of subsistence."

The thoughts and feelings expressed in Einstein's own words create an authentic self-portrait. The subject is peace, but it is undoubtedly true, as the editors note, that "his personality emerges as it would no matter which segment of his scientific or nonscientific interests might have been described."

In all he said or wrote, whether to Bertrand Russell or a Brooklyn teacher facing a congressional committee, to Gandhi or a student defying the draft law, to his old friend Queen Elizabeth of Belgium ("Dear Queen") or an uneducated manual worker, the same person was unmistakably present—a good, rational, gentle, compassionate man.

In devotion to humanity, Einstein has often been placed in the company of two other men of his time—Gandhi and Schweitzer. There was, however, a profound difference. He was free of the ruthlessness with which they committed to the causes that consumed them their families, their friends, and all who came within their orbits. Perhaps this was because his full-time preoccupation as a scientist with the nature of things permitted him to be only a part-time saint.

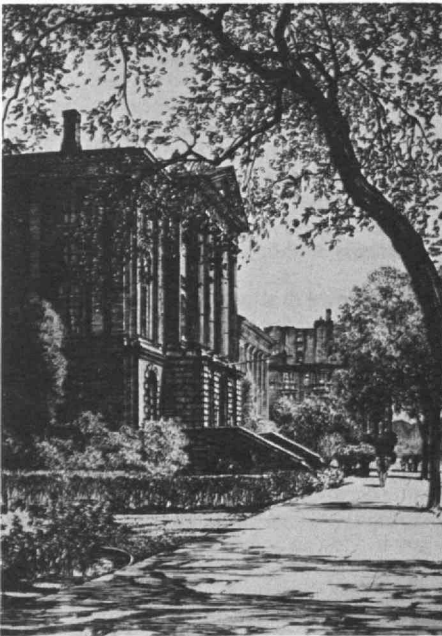
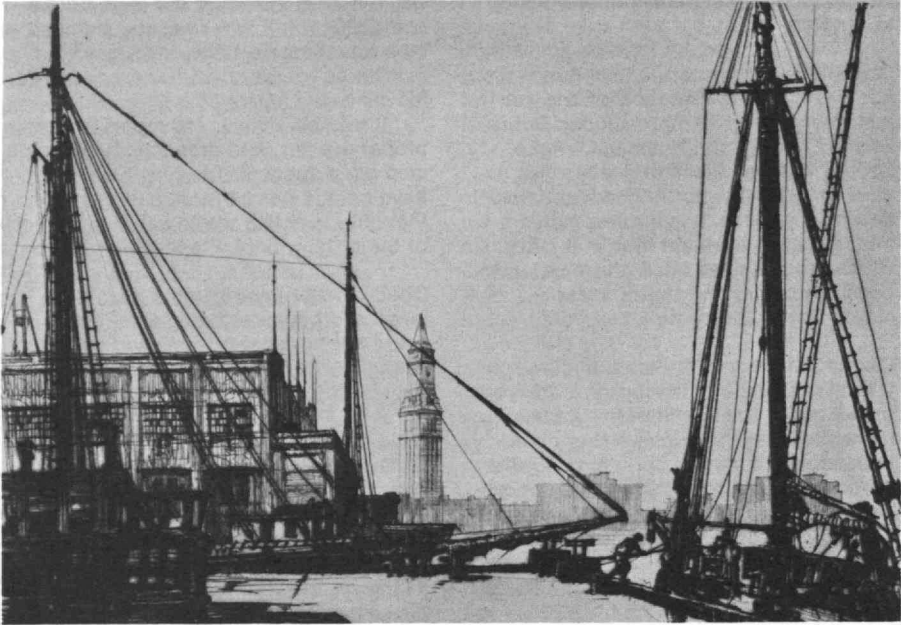
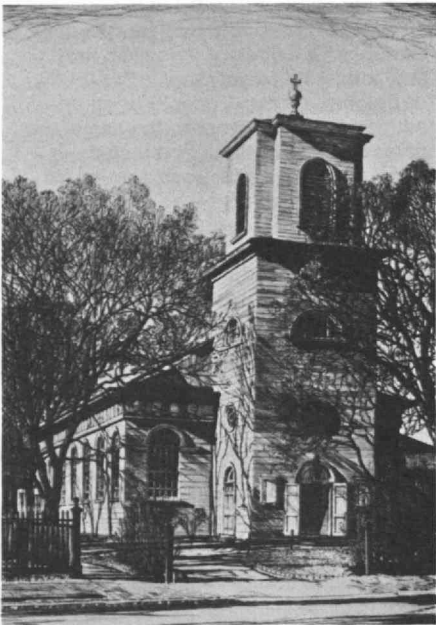
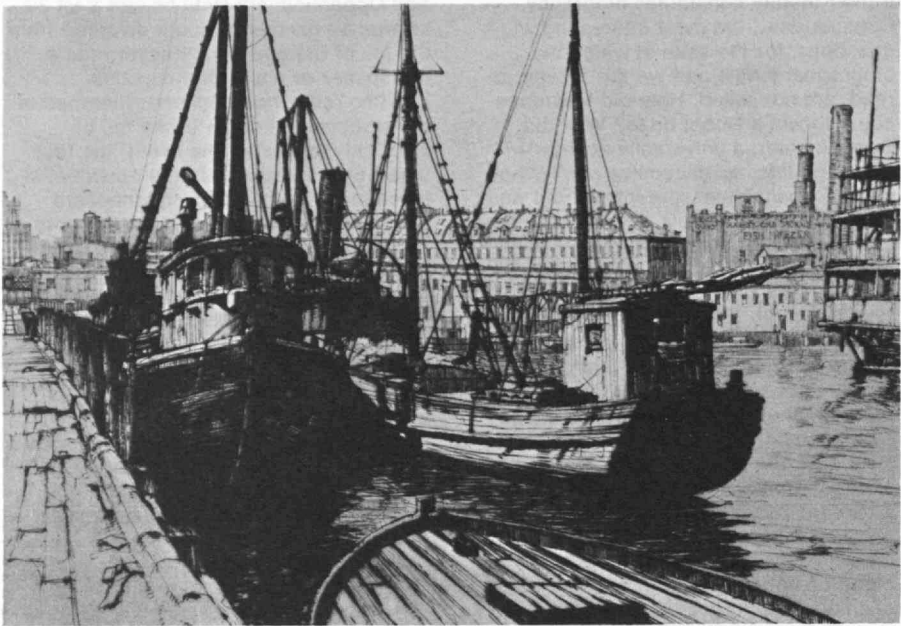
#### **New from the M.I.T. Community**

*Etched in Sunlight: 50 Years in the Graphic Arts*, Samuel Chamberlain, '18. Boston: Boston Public Library, \$20. The story of Samuel Chamberlain's interests and achievements in the graphic arts begins in an M.I.T. classroom, where a "shy and bewildered young man" was attending his first life class. Now he is an artist who "has opened our eyes to our architectural heritage." Mr. Chamberlain's modest autobiography fills this immense gap with a simple text and exquisitely complex sketches, etchings, and photographs.

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To keep the architect busy with T-square and triangle after he had seen Paris turned out to be impossible, and Samuel Chamberlain, '18, succumbed to the "ignominious" temptations of the commercial artist. But his love of architecture has mingled with his artistic gifts, as Sinclair H. Hitchings, the Boston Public Library's Keeper of Prints, points out in his introduction to Etched in Sunlight, Mr. Chamberlain's new autobiography. The result is a style with "clear, unforgettable images that crystallize atmosphere and character and bring the viewer back to look again." Among the works reproduced in Etched in Sunlight are drypoints of the Rogers Building, M.I.T.'s first real home, Mt. Vernon Street on Beacon Hill, Boston Harbor, and Christ Church in Cambridge. (Photos: Boston Public Library from Samuel Chamberlain, '18, Etched in Sunlight)



# The Cultural Revolution: New Directions for China

*The Spirit of Chinese Politics: A Psycho-cultural Study of the Authority Crises in Political Development*, by Lucian W. Pye. Cambridge: The M.I.T. Press, 1968.

Exactly 200 years ago Richard Arkwright, an English barber, invented the water frame, a thread-spinning machine so heavy that to use it factories and mills had to be built. The waves of what is generally called modernization/industrialization/urbanization/the age of science have since rocked the world, East as well as West, South as well as North. The landscape has been changed, family functions are different, old institutions have been replaced by new ones, old gods by new gods.

Over 40 years ago the philosopher Alfred North Whitehead said, "It is the first step in sociological wisdom to recognize that the major advances in civilization are processes which all but wreck the societies in which they occur—like unto an arrow in the hand of a child."

Those who study these events are no longer exclusively historians of particular cultures but scholars who would ferret out universals of development from among the unique cultural adaptations and transformations of each particular heritage.

To some extent these scholars are social engineers who ask the question, "If bureaucratic specialization, increased environmental control, restructured elite-equalitarian tensions, followership as well as leadership of authority, all in the context of a 'global village'—if all these are bound to be, how do we advise those with power in one particular country how to achieve the inevitable most quickly and at the cheapest cost (in human as well as economic values)?"

Lucian W. Pye, an M.I.T. political scientist whose youth was spent in China and whose scholarship has been in the area of Asian modernization, has focused his attention on long-term Chinese attitudes and behaviors, the Chinese way of politics.

What first strikes the observer of the People's Republic of China is change, an

apparent repudiation of the past: a revolution, the substitution of Marxist "struggle" for Confucian "harmony," the dispersal of the old elites and the honoring of the worker-peasant. Yet, despite such seeming transformations, Professor Pye finds that the Communists, perhaps unsuspectingly, continue to support major Chinese traditions: the nearly exclusive public sector as contrasted with the private sector, a political hierarchy, a formal ideology (Communist instead of Confucian), more governmental leadership than followership. Although the new officials come largely from classes different from the old mandarins, they move at the old leisurely pace.

During their lengthy struggle for power in China the Communists whittled down rival wielders of power: the Japanese in North China, the Nationalists (*Kuomintang*) during the Civil War, the landlord class, the rich peasant. Sovereignty, external and internal, was theirs except for Taiwan Island and the Gulf of Tonkin. The earlier roadblocks to modernization were gone. There was an official Marxist-Leninist-Maoist ideology with a hard core of tested believers. The locus of politics, as of power, was the Chinese Communist Party. People and party were united in wanting to work diligently to restore China's assumed rightful place as leader of its world.

But, unfortunately for the political observer, the politics of Communist China have taken place mainly under wraps. Though the details are incomplete, we know that, although there was great agreement in principle on what Mao Tse-tung deemed most important—"party leadership and the socialist path"—there were internal party tensions galore: agriculture vs. industry, region vs. region, industrialization vs. military modernization, functional specialists vs. revolutionary generalists, "old cadres" vs. "new cadres," party vs. government, centralization vs. decentralization, and so forth.

Reality is many faceted; political issues tend to polarize. The political polarization came to public view in the Great Proletarian Cultural Revolution of 1966 to the present. Chairman Mao, part of the

party, part of the government, and part of the Red Guards struggled against Chief of State Liu Shao-Chi, party secretary Ten Hsiao-p'ing, part of the party, part of the government, and part of the Red Guards—all in the name of the thoughts of Chairman Mao Tse-tung, "our great teacher, great leader, great supreme commander and great helmsman."

One of the tensions that has been a condition of the lives of scientists in the People's Republic of China is what the Communists refer to as "red" vs. "expert," a situation described in detail by two authors in *Technology Review* for October/November. The intellectual elite has the specialist knowledge that will give China the power it wants. But members of the intellectual elite have the wrong class origins—often they are the children of landowners, of the rich, of other professionals; they are seen as tainted scholar gentry, as symbols of bourgeois values. They think of themselves, of their families, of their material comforts instead of the whole community as directed by the leadership.

When the Central Committee of the Chinese Communist Party laid down the ground rules for the Great Proletarian Cultural Revolution in August, 1966, it protected to a degree the intellectual elites: "Special care should be taken of these scientists and scientific and technical personnel who have made contributions. Efforts should be made to help them gradually transform their world outlook and their style of work."

But, as both C. H. Geoffrey Oldham and A. Doak Barnett pointed out in last month's *Technology Review*, the conflicts have tended to make the air thick with fear and menace. For the scientist to play his role more successfully, the polarization of politics in the Cultural Revolution of the present must be replaced by the many sided gives and takes, pushings and haulings, of the usual politics within a bureaucracy or, eventually, within a larger section of society. Learned Hand has said, in another context, "Were the old questions ever answered? . . . Most issues are not decided; their importance passes and they follow after." The many sides of reality overcome the temporary polarization.



From the long-term viewpoint of Chinese history as well as from the modern demands of development there is some possibility that the scientific and technologically expert faction of the Chinese political bureaucracy might eventually be the vanguard in the decentralization of power and decision-making. The old scholars ran the imperial bureaucracy; they had the highest status in the traditional culture; the new scholars have the expertise necessary to achieve the Chinese dominance wished for by all. The scientists with their Western training have lost some of the shackles of traditional, slow-moving Chinese ways, are intellectually more flexible than the revolutionary "red" leadership. Who, indeed, are more guilty of the "four olds" (old ideas, old culture, old customs, old habits), the party officials or the scientists?

Some students of comparative development suggest that with more choices available there are likely to be more participators in politics and power. Should the scientists expand their participation in the process of Chinese politics, this notion may well be borne out in what is now seen as one of the more totalitarian politics.

One of Professor Pye's conclusions is, "As a revolutionary regime committed to mobilizing an entire society along totalitarian lines, the Chinese communists might appear to be more fully dedicated to modernization and development than the more moderate governments in most of the developing areas. Yet in seeking to evaluate the comparative advantages of different approaches to development it is essential to distinguish between surface appearances and substantive gains. The mere effort to establish a totalitarian system produces many surface features of modernization; totalitarianism is uniquely a product of the modern industrial world, and we tend to associate its way with the world of tomorrow rather than that of yesterday. In the flow of history, the concept and practices of totalitarianism become possible only after the emergence of industrialized societies had produced a capacity for building large-scale and highly disciplined forms of human organization. Hence any pre-industrialized

society rash enough to adopt the totalitarian model can achieve the aura of being more developed than in fact it is. . . .

"Possibly enough time has gone by for us to be able to say now that totalitarianism does not provide an inherently easier way of achieving rapid economic and social development and that the maintenance of a totalitarian system can in fact become a substitute for development."

For all nations there must, apparently, be government followership of public opinion as well as leadership. In the Chinese Communist phrase, the movement is "from the masses to the masses." Both the limits of the past and the demands of the future condition the political process at the present. He who would mount the tiger is in for a rough ride.

*Donald W. Flaherty has studied and taught in China and Hong Kong; he is Professor of Political Science at Dickinson College.*

For the past several years, M.I.T. has conducted interdisciplinary student projects in systems engineering. For each new project a large-scale problem on the outer limits of technology is assigned, and the students develop all its interlocking aspects from beginning to end, concurrently fitting differing technologies into a design, a schedule, and a budget, optimizing each phase and component of the project in terms of over-all system performance.

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Is the demonstrated success of new information technology in business, industry, and private institutions transferable to the arena of public policy-making? The author avers that it is and supports a case for imperative action

John S. Saloma, 3d, '56  
Associate Professor of Political Science, M.I.T.

# System Politics: The Presidency and Congress in the Future

The new directors of our political destiny whom we have sent to Washington will perform their duties for us with superior dispatch and wisdom if they call into use quickly the rapidly developing resources of new information technology. It is the thesis of this presentation that the availability of comprehensive information systems can today improve the quality and rationality of decisions reached in the political process. I believe further that with responsible support some of the impressive advances forecast for computer technology can by the mid-70's be adapted for the personalized use of the President, congressmen, and a wide range of public officials.

Computer-based analysis as it is refined over the remaining decades of this century will make possible an advance in human intellectual capacity comparable to the invention of language, arabic numerals, and calculus. With his new ability to understand the dynamics of complex organizations and social processes, the congressman of tomorrow will explore a range of problems previously beyond the grasp of his predecessors.

Decision-making, by one definition, is simply the "process of converting information into action." First-quality information is intelligence that is clear, timely, reliable, valid, adequate, and wide-ranging. It is information that lays a solid foundation for decision and action—the kind of intelligence a conscientious legislator must have whether it is *technical* information (defining the content of a policy issue) or *political* information (concerned with the relative strength of competing claims and the consequences of alternative decisions).

Mid-1970 is only six years away—is it possible that improvements in the legislative process from wide use of advanced data systems will actually be achieved by 1975? Studies by RAND Corporation experts suggest that by the early 1970's computers will be small, powerful, plentiful, and inexpensive. Computing power will be available to anyone who needs it, or wants it, or can use it either by means

of a personal console connected to some large central facility, or by a small personal machine. Additional projections foresee, by 1975, a computer that will make possible automatic libraries able to look up and reproduce copy; by 1978, automated looking up of legal information, and the widespread use of automatic decision-making at the management level for industrial and national planning. By the mid-1980's, the computer will begin to realize its potential as a research tool through modeling and experimentation, as an integral part of the educational system, and in areas such as medicine and biological sciences. The chances are that technical advance will continue to outpace political applications. The issue is not whether Congress will adapt to this potential but at what speed. The sequence of acceptance may go something like this:

First, congressional resistance to computer technology, notably the failure to fund any central computational facility for use by the Congress, the failure to budget any allowance for congressmen to utilize other facilities, and the failure to provide analyst staff for the use of the committees and/or members; Then, limited congressional acceptance of computer facilities and analyst staff with access tightly controlled by the individual committees and/or party leadership; and Finally, open congressional acceptance, with all members enjoying "free" use of computer facilities and full access to staff and data resources. According to our assumed projection, Congress could have moved all the way to the third situation by the mid-1970's.

## The New Congress—1975 Edition

What would a Congress look like in this third stage of free exchange and availability of information? We can suggest a few intriguing possibilities:

1. The contributions of the individual legislator would be considerably enhanced. Although only a minority of congressmen will choose to play the



role of legislative inventor or watchdog, the effectiveness of such members will be enormously increased by computer-assisted techniques of search and analysis. Members will be free to "browse" through the data archives in developing and assessing legislative alternatives. Some legislators will hire professional analysts on their office staffs or acquire analytical skills themselves. While such legislative diligence will still be the exception, one can readily foresee a congressman sitting at a console in his office pouring over computer print-out into the late evening hours or over the weekend and cutting through the paper arguments and justifications of executive programs with penetrating lines of questions. The possibility of abuse also exists, but the weight of past congressional experience suggests that most congressmen will use such new investigative power wisely. In situations that invite adversary argument, alternative positions and points of view will be more thoroughly developed and cogently presented.

2. *Ad hoc* congressional study and work groups would freely form and disperse as new and challenging tasks arose at the interstices of committee power. Warren G. Bennis, Ph.D.'55, and others have suggested that transient work groups composed of interdisciplinary teams of highly skilled specialists will replace hierarchical bureaucracy as the dominant form of organization in the post-industrial society (see *Technology Review*, Apr., 1966, p. 36 and Apr., 1968, p. 37). The congressional milieu with its weak hierarchical structure offers a logical setting for such work groups. Congressmen who might lack the requisite skills or resources to tackle a legislative problem by themselves could easily pool their efforts. The work of study groups would be "collateral" to that of the standing committees, but would introduce a "helpful and needed resilience into the congressional posture," in the words of George E. Agree, former Executive Director of the National Committee for an Effective Congress. To the extent that such work groups succeeded and posed a competitive challenge to the existing committee structure, they might serve to improve the quality of committees generally. Standing committee leaders might seek to co-opt able young members, according greater weight to subject matter expertise. They might also advance talented members to subcommittee chairmanships faster than might otherwise have been the case. The committee system of Congress will still be organized in terms of the norms of specialization and reciprocity, but specialization will be much less dependent on the opportunity of one's initial committee assignment and accumulated seniority than it will be on the individual member's motivation and time commitment to mastering a given area of substantive policy and appropriate instruments for analysis.

3. While information systems afford new possibilities for specialization and increased committee power—especially in the area of legislative oversight or control of the executive bureaucracy—they should also afford possibilities to "democratize" committee power. Where limited information previously conferred important advantages on those few individuals who had the legislative seniority and central committee positions to accumulate such information, now generalized availability of information and program analyses would enable junior committee members and interested congressmen not on the committee to gain a better understanding of the issues involved. The majority would have greater opportunity to influence committee action and to prevail against the committee on the floor when its action was not representative of the views of the entire membership.

4. Generalized information systems should enable Congress to satisfy both the necessity for specialization and the goal of comprehensive policy review. Where information on executive agency activities has been compartmentalized within the executive budget and the congressional committee system, it would now be available on a comprehensive basis. The "special analyses" of the federal budget already being developed by the Bureau of the Budget are a prototype of the kind of comprehensive information that congressional committees will be able to tap. Individual congressional committees, no longer limited to information within their agency jurisdiction, could become important points for government-wide program review and co-ordination. Where the President alone has had the information to develop a measure of agency co-ordination, congressional committees would now share that information, and the authority to use it, subject to the majority support of Congress.

### **Recognizing the Imperative**

These desirable goals are not outside realizable range—already they are within the gun sights of some forward-thinking legislators. A resonant note of anticipation can be heard on Capitol Hill. Members privately express the desire to be aware of coming problems so they can "gear up" for them. A few senators and congressmen already sense that information technology is the coming thing and are investing their own time as well as that of their committee and office staffs in developing closer familiarity with information systems.

Most articulate among spokesmen for congressional action is Representative Robert McClory of Illinois, who, during the 89th Congress, introduced the first bill in either House or Senate directly applying automatic data processing techniques to the work of Congress. In January, 1968, the legisla-



tive branch acquired its first automatic data processing installation—an on-line terminal system, installed in the American Law Division of the Legislative Reference Service, Library of Congress. It enables L.R.S. to record and store on magnetic tape descriptions of all bills and resolutions introduced in the 90th Congress. After reviewing the system, Mr. McClory anticipated that some of the next automatic data processing applications might be:

1. Daily print-outs summarizing the previous day's congressional action.
2. An automated index of congressional documents and legal periodicals.
3. Up-to-the-minute information on legislative issues scheduled for debate.
4. Vote summaries on bills already passed.
5. Status of legislation pending in committee.
6. Description of information stored on computer files in the executive departments.

Although several state legislatures have been well in advance of Congress in developing applications of the computer in the legislative process, the Washington atmosphere is now thick with interest. Committees of the Congress are giving increasing attention to A.D.P. possibilities; the Legislative Reference Service has developed several papers on the subject for congressional consideration; the General Accounting Office has installed a new Systems Analysis Section in its Office of Policy and Special Studies; several privately sponsored Washington seminars have been held on information technology including those convened by the American Enterprise Institute for Public Policy Research, the Brookings Institution, and evening panels brought together by the Washington Operations Research Council and the Institute of Management Sciences.

A number of competitive dimensions in Congress are likely to accelerate acceptance of innovations in decision-making developed in the private sector or Executive branch: the built-in tension between authorizing and appropriations committees both eager to control program decision; the publicity incentive for committee and subcommittee chairmen generally to identify themselves with innovations and to push for their implementation; the perennial congressional fear that Congress is yielding initiative and authority to the President; party competition; and the generational divide between "activist" and high seniority congressmen. While there are many factors that will reinforce traditional ways of making decisions within Congress, change is inevitable if for no other reason than that Congress cannot afford *not* to follow the rationalization of Executive decision-making.

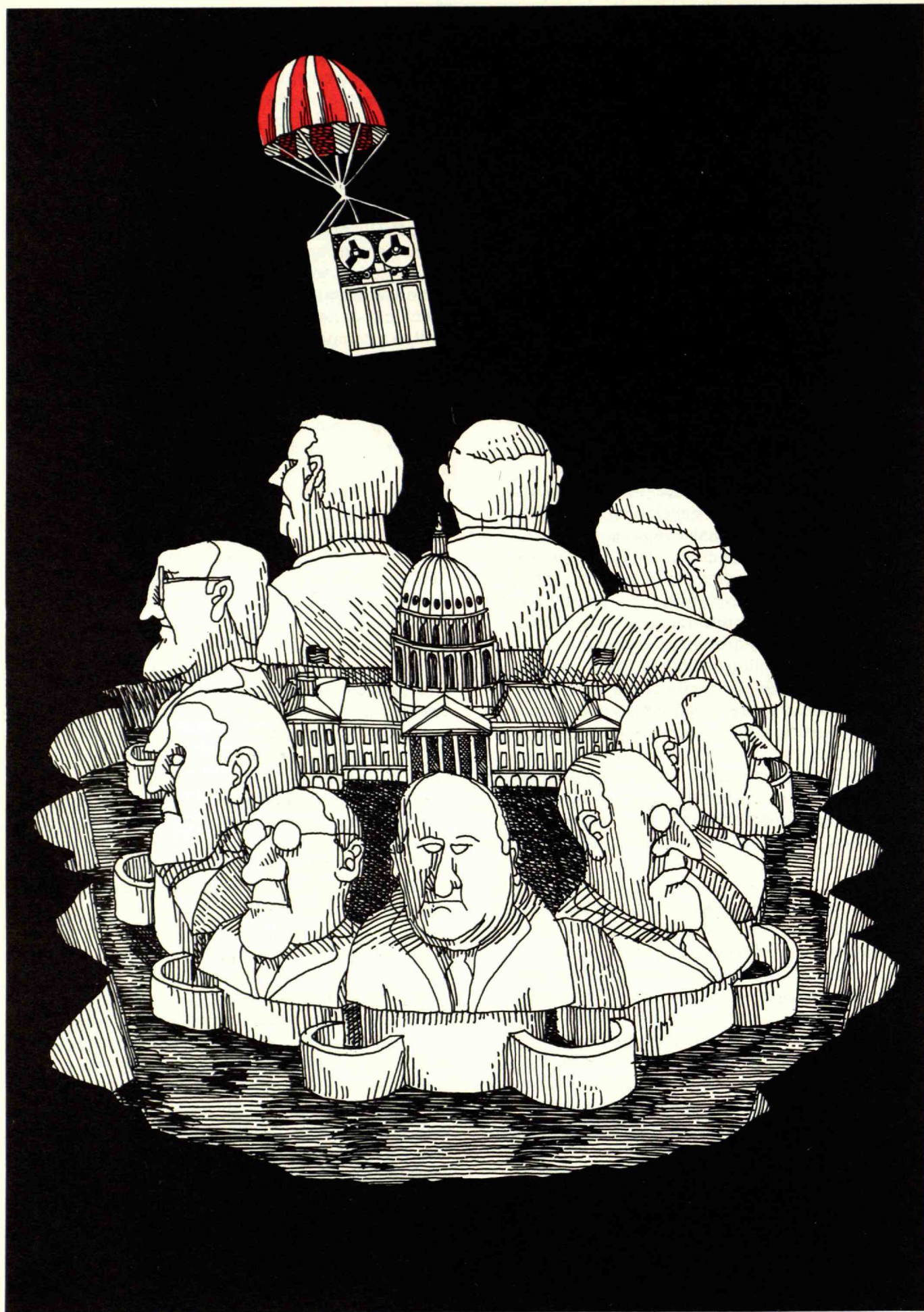
The real change in congressional attitude and skills will probably not be felt, however, until a new generation of political talent with practical experience with computers—through universities and the private sector—begins to enter Congress. This change will come sooner than most realize. One freshman congressman, formerly employed by the International Business Machines Corporation and a candidate for the doctorate in business/government relations from the Harvard Business School, Donald W. Riegle, Jr., of Michigan, caused somewhat of a stir in Washington in the fall of 1967 by sending then Secretary of Defense Robert McNamara a request for a matrix of 85 specific data items for which he (Riegle) had written a computer program. Another freshman senator with a combined engineering and law background, Howard H. Baker, Jr., of Tennessee, lectured the Association for Computing Machinery about the impending nuclear power breakthrough in breeder reactors that could produce power at almost zero fuel cost and the need for a much broader congressional overview and plan for the technological and social revolution that this implied. Senator Baker has been an articulate spokesman for a new Senate Select Committee for Technology and the Human Environment. However impressive individual examples may be, Congress as an institution has yet to experience the potential of information technology.

### **First Impact: The Executive Branch**

Whether the Congress acts sooner or later to improve the legislative process by using new information technology, its most explosive immediate political impact will be within the Executive Branch. The rationalization of program choice through greater availability of information and a more careful and explicit statement of program objectives, alternatives, and results will move the locus of program decision toward the cabinet secretary and the President. More adequate information systems will permit some functional decentralization of subordinate program decisions, although the thrust will be toward more effective policy control from the top. As the compartmentalized information resources of individual agencies are integrated into comprehensive information systems, political executives will have greater leverage over the bureaucracy. The new information technology will accentuate hierarchical control and reduce legislative bargaining within the Executive. The decision-making process will accordingly become more closed.

The Executive Branch is already a leg up in A.D.P. on the Legislative through its recent experience with P.P.B.S. (Planning-Programming-Budgeting-System). The likely extrapolation of this experience is toward the development of a corps of







highly trained professional "analyst" staffs within the Bureau of the Budget and the departmental secretary level. The power of these trained experts in the technology of information processing will pose new problems for congressional oversight. At a minimum, Congress will have to develop its own analytical staff if it is to monitor Executive decision-making. More important, it must watch for and correct new biases of specialization. Some observers question whether the new profession of systems analysis, drawing on multiple backgrounds of economics, physics, and engineering, can adequately deal with political decisions, over-all strategic planning, and public policy-making. Required instead may be more advanced professional knowledge and training that integrates the disciplines of political science and public administration with systems analysis, decision theory, and economic theory—i.e., political analysis.

Whatever their training, such well-organized and technically sophisticated groups will gain power at the expense of less well-organized, less articulate groups. Political leaders who combine technical education and sophistication with good political judgment will enjoy an advantage over old-line politicians. The government bureaucracy as a whole, with continuous "inside access" to information systems, will enjoy an initial power advantage vis-à-vis the legislature, the general electorate, and nongovernmental groups. As it becomes more pervasive, the new information technology will introduce qualitative changes beginning in the Executive Branch and extending outward—in the nature of the American system. The need to make one's political objectives or goals more explicit within the budgetary process will expose more conflict and disagreement than Americans have been accustomed to. The chances are, however, that we will know much more about ourselves and our politics and that this will both ease and complicate the problem of building political consensus. If the Executive decision process limits internal bargaining, the Congress may gain an enhanced role in developing political consensus.

Three major consequences, therefore, are likely to follow increased rationalization of Executive decision-making, especially in the budget process:

1. Centralization of effective decision-making under the President and his chief cabinet officers;
2. Development of a professional "analyst" class within the government and the need to reconcile new forms of specialization with broader social and political perspectives; and
3. A more explicit, candid style of politics which may complicate the problem of achieving political consensus.



### Some Payoff Projections

Let's project ourselves into the mid-70's, and beyond when advanced information technology has been widely adapted for governmental decision-making. We have suggested some of the changes this will bring at the level of *systems politics* (the way decision structures are organized) in both the executive and legislative branches of the federal government. What will be the gains or payoffs for the policy-maker himself? From analogies drawn largely from experience in industrial organizations, I believe the following projections of computer application to governmental decision-making to be neither exaggerated nor unrealistic for the potential of new information technology:

1. *Improved quality of information and information processing.* One of the most obvious advances that will be made possible by the new information technology is increased quality of information (including factors such as relevance, precision, completeness, and timeliness) and quality of information processing (accuracy, speed, ability to handle complex relationships, flexibility, and potential for codification in standard rules).

The resource and delay costs to the individual decision-maker who has access to governmental information systems will in time be minimal. Assuming for the time being no political restraints on access, the decision-maker should be able, through proper specification, to locate all relevant information anywhere in the system almost in-



stantaneously. Geographical and other forms of information "isolation" will end with a nationally (and eventually internationally) integrated information system. The inefficiencies and costs of information communication within human systems will be largely eliminated as many of the information processing functions of bureaucracies are assumed by programmed machines. The elimination of middle men between top officials and data gatherers or their replacement by top level data analysts will effect a major reduction in hierarchical distortion.

A vivid example of this potential of the computer to eliminate inefficiencies in information processing and retrieval is the current congressional concern with the "government dossier." Each individual citizen leaves behind him a trail of public and private records from the time of his birth. Much of this information is retained in the files of government agencies scattered around Washington and the country: income tax returns, applications for government employment, security clearance checks, social security and unemployment benefits, census data, etc. While access to some files is limited by confidentiality restrictions and limits of disclosure, it is still technically feasible to collect an enormous amount of information on a single individual.

On the positive side, the computer will give man the capacity to interrogate and reorganize massive data files almost instantaneously for social science research. Usable information which is accessible to decision-makers acting under time pressure should be increased by several orders of magnitude.

*2. Improved channeling of information—easing the problem of information overload.* In our foreseeable future there will always be more problems calling for the attention of a congressman than he can possibly consider. But with the computer the problem of information overload will be more subject to the control of the individual decision-maker. He will have the potential to get "on top" of his work. The computer can be programmed to provide top decision-makers with "exception" information demanding attention or action. The problem of management information, according to Gilbert Burck, is "not how to get information to the top, but how to keep useless information from coming to the top." Decision-makers may specify in advance what types of information they wish to receive on given subjects of interest as new information becomes available. Central libraries or document centers can then service the individual decision-maker according to his "interest profile" through a technique of "selective dissemination of information."

The computer will enable the decision-maker to specify one or more of several information formats and to reorganize data in terms of a desired format. Instead of being a largely passive recipient of information, the decision-maker will be able to interact with the data system using it as an active search mechanism as well. Whether he uses such control to enhance his legislative performance will depend on such human factors as courage, perception, imagination, sensitivity, and achievement motivation.

*3. Improved quality of the human decision process.* The computer has already demonstrated its capacity to discipline human thought processes. It requires clear and precise instructions. It must be told in every detail what it is to do and it follows orders—even incorrect orders—with exactitude. The computer is not only enabling but forcing the modern executive to think more explicitly and analytically—to make more formal his decision-making process and specify his judgments. More advanced computer programs reduce the amount of necessary detailed instruction but reprimand the programmer when he makes an error. Eventually, as computer languages are continually simplified, men will "tell" the computer what they want and delegate to the computer the authority to "tell" them what they must do to get it.

*4. The capacity for systems thinking and systems analysis.* The analytical concepts and techniques associated with the new information technology—systems analysis, program budgeting—are not particularly new. What is new is the capacity of automatic data processing to make "operational" the concept of an organization as a total system. "Men are not good calculators of the dynamic behavior of complicated systems," according to Professor Jay W. Forrester, S.M.'45, who has pioneered research in industrial dynamics. "The intuitive judgment of even a skilled investigator is quite unreliable in anticipating the dynamic behavior of a simple information-feedback system of perhaps five or six variables," he writes. A computer can handle such a problem with relative ease.

Melvin Anshen considers this "enlargement of the total range of decision-making" as potentially the most valuable contribution of the new information technology to management practice. It is now possible for the first time for the human decision-maker to consider the total activity of an organization as "a simple integrated system. Within this system, a dynamic network of relationships can be discerned and measured, with feedback loops and forces for multiplying and dampening the effects of actions at earlier stages in the continuous process. Analytic techniques based on the programmed computer permit managers to simulate the per-



formance of such a system and test its output under a range of changing variables within and outside the system. This technical advance is only one among many possibilities now available for extending the scope of decision-making."

5. *A lengthened time-perspective with greater opportunity for strategic planning.* The new information technology should effect important changes in the time perspective of the decision-maker. The amount of crisis decision-making, i.e., time spent in reacting to unanticipated crises, should be decreased by the development of better warning indicators and monitoring systems. Simulation will permit the economic preparation of major contingency plans. The management information cycle will be reduced significantly by real-time information systems. The concept of "feedback" defined as "the decision response to the state of the system" will be supplemented by a new concept of "feed-forward" relating to "decision responses to *anticipated future disturbances* of the subsystem being controlled by the decision-maker," in the words of Martin Greenberger.

The programming of routine decisions and the control of information overload through techniques of selective dissemination will both serve to free the decision-maker from the burden of repetitive operations and detailed information. The "remedial orientation" of incremental policy-making will be replaced by an orientation toward the future. The policy-making as opposed to the administrative role of the public official will be enhanced. The new information technology will draw the attention of analysts and decision-makers to higher-level, longer-term problems.

6. *The breakthrough in collaborative research—"the on-line intellectual community."* The computer will enable or facilitate two types of significant advance in collaborative research—which in the long run may well be its greatest contribution to man's capacity for problem solving. The first of these gains is in the cumulative storage and preservation of solutions—a kind of division of intellectual labor—and the second, in the potential for man-machine-man interaction.

New and more refined computer programs are constantly being developed, tested, and stored. The *compiler* allows the computer programmer to call, combine, co-ordinate and use routines or programs that are already perfected and stored in the computer. In theory, once a particular problem situation is solved, it is solved for all time. Other users of the computer network can draw on any approved program that is in the system. Given the virtually infallible memory of the computer, all gains or improvements in techniques of computation and

analysis, no matter how incremental, are preserved until better techniques are perfected and may be retrieved, used and refined by contemporary and future generations of decision-makers.

Computers will rapidly take over most of the routine, repetitive decisions that can be "programmed" at the lower levels of government and other large organizations. Even in the area of nonspecifically programmed or ill-structured, novel problems, the computer will become a powerful tool. If most human decisions have an underlying structure, as disjointed, incremental, restricted in scope as that structure may be, in time computer programmers and analysts will discover and program the implicit decision techniques, rules, and coefficients. Already computer programs based on the analysis of past managerial behavior have proved more efficient than continued management practices (i.e., rules of thumb) based on experience. Most computer experts do not expect the computer to replace the human decision-maker but rather to extend his planning and decisional capacities through the continued refinement of man-machine interaction.

Even more significant than the steady development of computer programs is the advent in prototype form of "the on-line intellectual community" based on man-computer interaction and computer-facilitated co-operation among men in a university setting. Carl F. J. Overhage and R. Joyce Harman, '45, describe the potential breakthrough based on the experience of Project MAC (research and development of Machine-Aided Cognition and Multiple-Access Computer systems) at M.I.T.:

"Because communication among men is fallible, and because heretofore men did not have effective ways of expressing complex ideas unambiguously—and recalling them, testing them, transferring them, and converting them from a static record into observable, dynamic behavior—the accumulation of correlatable contributions was opposed by continual erosion; and melding of contributions was hampered by divergencies of convention and format that kept one man's ideas from meshing with another's. The prospect is that, when several or many people work together within the context of an on-line, interactive, community computer network, the superior facilities of that network for expressing ideas, preserving facts, modeling processes, and information and the same behavior—those superior facilities will so foster the growth and integration of knowledge that the incidence of major achievements will be markedly increased."

Comparable networks will in time be available in business and government and between sectors of each of these communities with overlapping re-



search interests. The promise of man-machine-man interaction for pure and applied research is one of the scarcely realized but most staggering potentials of the new information technology.

### Obstructions to the Information Revolution

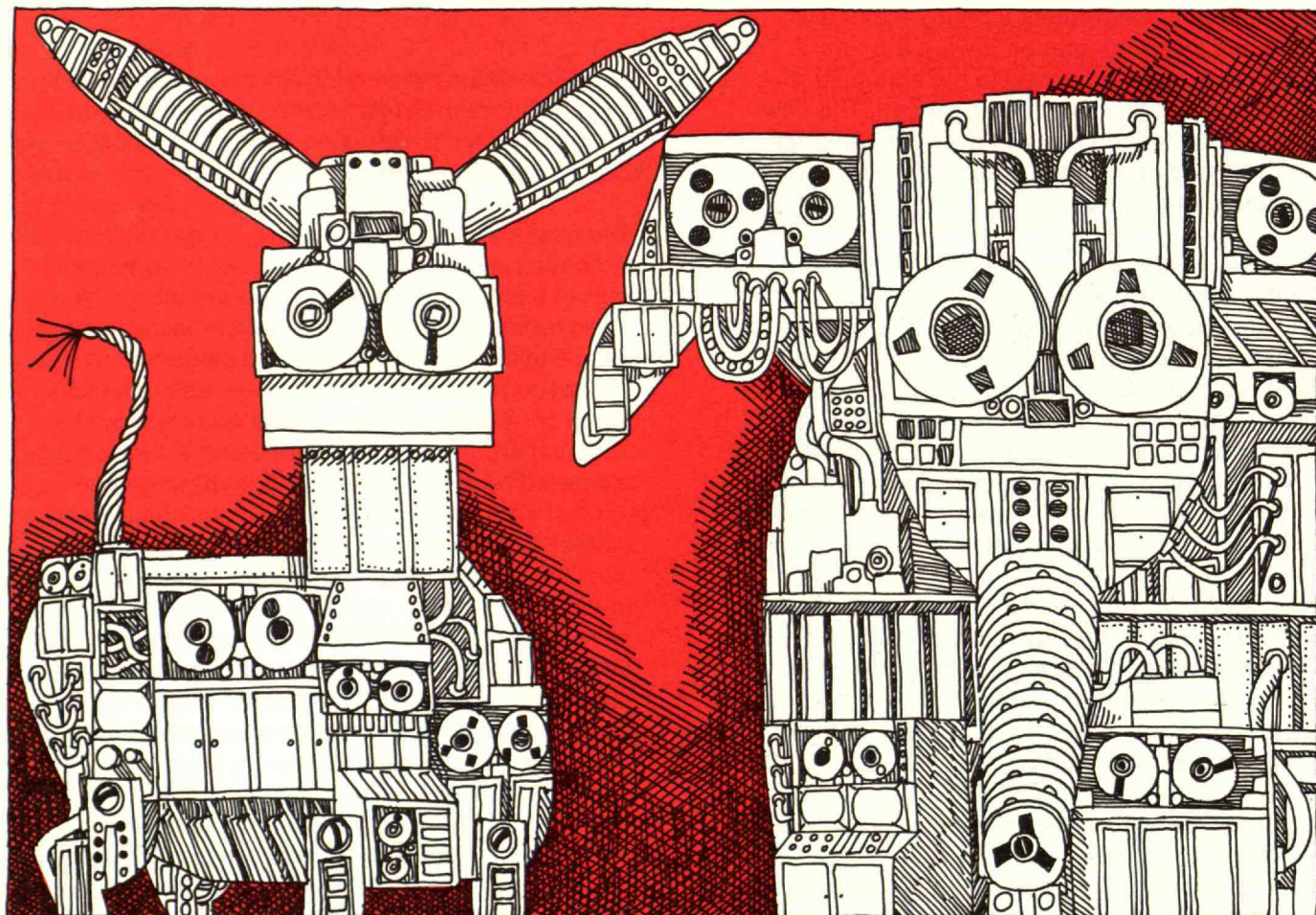
Having thus surveyed some of the more impressive rewards that unquestionably await both managers and law-givers of government when they discover and develop the full potential of information technology, we must plant a few red flags along the computer highway. Lessening information constraints on and increasing the potency of analytical tools available to decision-makers will not remove many current dilemmas in decision-making. These limitations go well beyond information as such.

1. *The problem of values.* If we define politics as a struggle for control stemming from conflict over the direction of social life, over public policy, it is clear that the central problem of politics is one of values, not information. Decision-making involves values at all stages. Choice activity especially requires value criteria for decision. At lower program levels, it may be possible to compare alternatives and choose a more efficient means for achieving an agreed upon objective such as disease control, improved maternal and child health care, or improved income maintenance. (Even this ap-

proach, it should be noted, ignores the problem of interpersonal comparison of utility.) But at higher program levels, can improved information help a decision-maker weigh major dissimilar program alternatives such as an antiballistic missile system or a domestic Marshall plan for the nation's urban centers? Only insofar as such information gives the President, the budget director, or the congressman better understanding of what \$X million dollars allocated to program alternative A or B will actually buy in benefits. In government, budgeting is a political activity and the problem of choice or allocation ultimately remains one of values.

The decision-maker's values will also shape his intelligence activity, i.e., finding occasions for making decisions, and his design activity—how he structures alternatives for choice. Data must be structured or organized before they become meaningful. Predetermined data-structures can help, but the decision-maker himself must constantly synthesize knowledge in an interdisciplinary fashion. He must interpret, project, and interconnect fragmented information. The political decision-maker has a natural tendency to select and adapt information and to screen out that which is "politically undigestible."

In a decision-making environment where resources





are relatively plentiful (i.e., where economic criteria for resource allocation are less relevant) and where the decision-maker has the analytical and information processing capabilities to structure in advance innumerable alternative solutions, the value perspective of the decision-maker will become increasingly important. With these reservations, information can still make an effective contribution to decision-making. If we are correct in our estimate that computer-based techniques such as systems analysis and simulation will afford decision-makers in the Executive and Congress much greater understanding of complex problems, such as those of our urban centers, then the gains may be substantial. As social problems appear more susceptible to rational solution, it should be easier to develop a political consensus to do so. As to the final judgment on values, the American political system will continue to specify the goals and objectives toward which political decision-makers must move.

*2. The political use and abuse of information.* It follows from the preceding remarks that information systems in government may be used to serve the political purposes of the political actors who have the resources to control them. Information may be processed with conscious policy or partisan biases. Both information and analysis may be abused in the furtherance of specific political objectives. Bargaining and compromise will remain a principal feature of the democratic process, although they may involve different participants and a new language.

Decision-making in government cannot be abstracted from the political system within which the decision-maker operates. How then can one prevent the President or program-oriented bureau chief from consciously or unconsciously biasing an information system that Congress must use? Can the same information system in Congress serve both Democrats and Republicans?

The answer lies in two directions. First, major data sources of the Federal Government, with multiple users, could be kept as "neutral" as possible through statutory control, reinforced by regular checks by inspecting authorities such as the General Accounting Office. Second, specialized users including the President, the Congress, and the party leaderships within Congress could develop their own private information systems in parallel with the central data system and in accord with their own needs. Through this differentiation it should be possible to keep the policy and partisan biases of central governmental information systems under control and to recognize explicitly the use of competing information systems for some adversary situations.



*3. Additional cost factors.* The introduction of information systems will mean some new costs as well as increased capabilities. The obvious immediate cost is that of capital, both for hardware (the basic computational facility) and software (the development of programs appropriate to the specific user). We suggest that this economic cost factor will rapidly decline in the coming decade or two and be minimal by the end of the century. A second cost factor is the need for much more highly skilled personnel. As already noted, a new profession of "analysts" will be needed in government. However, the computer will not necessarily become more "distant" from the lay-user, including the congressman. The educational and skill levels of the general population and "familiarity" with computers should also rise. And more advanced computer technology and programming should lead to the development of some computers that can be operated with relatively low skills. The decision-maker who wants to use the full potential the computer of the future will offer will probably employ and work with specialized analyst staff.

Other "technical costs" must be anticipated in adapting information systems for government. These include: (a) a natural tendency towards greater reliance upon quantifiable data, (b) programming bias that may reduce the sensitivity of the system to new types of data and significant changes in the environment, and (c) the elimination of inputs—interpretations, opinions, and statements of self-interest—previously provided by intermediate level officials replaced by the information



system. All of these tendencies suggest a new need for congressional oversight or review of the Executive. The computer improperly used could well lead to new rigidities in official behavior that would be inimicable to an open system of decision-making.

4. *The problem of final payoffs.* Anthony Downs, in a searching critique of the expectation of "urban-information-systems" enthusiasts, calls into question "the intuitively plausible but actually misleading assumption" that "better data in urban decision-making would have huge final payoffs, because . . . better information would reduce both the frequency and the magnitude of planning mistakes." Downs argues that three factors make it difficult to prove that better data will lead to more effective decisions: (a) the extreme difficulty of measuring the effectiveness of decisions; (b) variances in measurable effects caused by factors other than data inputs; and (c) the problem of whose values to use in calculating payoffs. He concludes that many urban decision-makers will be reluctant to make large initial investments for what will "probably seem like only marginal gains in final payoffs."

The basic point is well taken—one must go beyond the technical payoffs of improved information in assessing the value of information systems in government. I am more optimistic than Downs, however, on three points: (a) the assumption that capital costs to users will steadily decline; (b) the possibility for controlled simulation of systems behavior; and (c) the cumulative effect of marginal gains over time.

5. *The power consequences of information systems.* Information systems have important power payoffs as well as technical payoffs. Their introduction involves relative power shifts among political actors. These power consequences of information systems greatly influence the form in which they are adopted and how they are used. For some, the threatened loss of power may be sufficient to lead to active resistance to the new systems.

Acknowledging these reservations, I am still persuaded that the combined and cumulative impact of the new information technology suggests some radical changes in the environment of governmental decision-making. The shift will be from a negative to a positive orientation toward problem solving. The incrementalist's view that "public policy problems are too complex to be well understood, too complex to be mastered" and that decision makers develop "a strategy to cope with problems, not to solve them" will be replaced with a more optimistic perspective. The decision-maker will be "on-top" of information. He will have ana-

lytical techniques and information processing capabilities that will give him new understanding of governmental and social systems and with this a sense that he can manipulate and control them. Where the incrementalists have rejected "the impossible prescription to be comprehensive" in favor of a more manageable strategy of "outright neglect," the new information technology will enable the decision-maker to develop a *more rational* and *aggressive* strategy of problem-solving. The distinction is fundamental.

#### **Challenge to Separation of Powers**

While the application of information technology in government will have its greatest immediate political impact *within* the Executive (with important secondary consequences, as we have observed for the Congress), the longer term consequences of better information in government raise fundamental questions about the American system of separated powers. Congress and legislative bodies generally need *not* lose power to the Executive. The potential advance in information technology is theoretically equally accessible to *both* the President and Congress, with Congress standing to enhance its powers versus the Executive considerably. The central dilemma of American politics—how power should be organized in the American political system—will be faced once again, but this time in its starkest form.

The policy or control functions of the President and Congress will become less distinguishable as both develop the capacity to ask program questions and undertake analyses of data from the same generalized information systems or specially developed systems for their own use. One restraint on a fully developed congressional policy role in the past has been the unwillingness of Congress to build a parallel legislative staff bureaucracy. As a result, Congress has often had to "second guess" the Executive without the information to back its hunches. Now, as technology generalizes the availability of information, Congress can tap into Executive-based information systems, estab-



lish quality controls, and develop more limited information systems for its own specific requirements. Program budgeting suggests the potential leverage that may accrue to Congress. The Executive bureaucracy, under the direction of the President and Budget Bureau, will structure program choices and undertake analysis of various alternatives. Congress will be presented with a program budget which may easily be rearranged by traditional line-item categories or into other desired formats. Congress will review program choices, evaluate analyses with its own analyst staff, and make its own determination of priorities. The process of making choices and analyses more explicit enables Congress to participate much more intelligently and vigorously, with a *limited* staff, in the decision-making process. In fact, there may even be a danger of too vigorous participation.

Will the President permit Congress to have access to the information resources and analyses of the Executive branch? Insofar as analyses are used, he will have to justify his program requests. Other background analyses and alternatives may not be presented to Congress. In such case, these would have to be duplicated by congressional analysts. (Congress would want the capacity to go beyond alternatives presented by the Executive in any event.) In fact, the effectiveness of implementation of the right of Congress to information will be a critical test in the future of the degree of congressional autonomy within a system of separated powers.

We can only speculate on the new definition of the separation of powers that will evolve. Distinctive presidential and congressional biases may soon develop in the decision-making process. We might expect the Executive to overemphasize the benefits of rationalization in program formulation and administration, to overvalue economic and technical criteria of performance. If, as some observers anticipate, the new information technology leads to "an increasing separation between operating missions, life-styles, and social roles for those institutions and individuals involved in rationalized activities compared to those involved in nonrationalized ones," Congress, representative of a society embracing both life-styles, would inherit the difficult task of mediating the impact of the former on the latter and restraining the tendency toward irrational and frustrated response. Congress would add elements of "political rationality," considerations of human costs and benefits to the decision-making process.

In this context, one rationale for the separation of powers—"systemic dissonance"—takes on new significance. We have suggested through this discussion that the revolution in information tech-

nology represents an almost immeasurable potential increase in man's knowledge—especially in his understanding of and ability to control his environment. The intelligent use of that knowledge and the power it confers is an awesome responsibility. In a political democracy it involves the democratic consideration of emerging technological possibility and consequence. The multiple perspectives of the American system, the numerous points of access for developing, testing, and advancing ideas may ultimately prove to be among the greatest assets of American democracy in the future.

*As a member of the M.I.T. Political Science Department, John S. Saloma, 3d, '56, has specialized in studies of the national political scene; he is identified with the group of liberal Republicans who have joined together as the Ripon Society. This article has been adapted for Technology Review from Professor Saloma's book, Congress and the New Politics, to be published by Little, Brown and Company in 1969; to satisfy requirements of space and style, the adaptation omits detailed arguments and citations. This book was made possible (in part) by funds granted by the Carnegie Corporation of New York to the American Political Science Association for the Study of Congress. The statements made and views expressed are solely the responsibility of the author.*

The photographs which accompany this article are by Henry B. Kane, '24, made to illustrate excerpts from Henry David Thoreau's *Walden*. The photographs and accompanying excerpts appeared together in Mr. Kane's book, *Thoreau's Walden: A Photographic Register* (New York: Alfred A. Knopf, 1946).

"We are acquainted with a mere pellicle of the globe on which we live. Most have not delved six feet beneath the surface, nor leaped as many above it. We know not where we are. Beside, we are sound asleep nearly half our time. Yet we esteem ourselves wise, and have an established order on the surface."





**Man's ultimate confrontation is with nature. On his understanding of the world's ecosystems depend his life, liberty, and happiness—and sooner than we think**

**David M. Gates**  
**Director, Missouri Botanical Garden**

# Exploitation, Evolution and Ecology

Man has lit the fuse of the environmental bomb. The question is not whether it will explode, but when. Responsible leaders of the nation, in and out of the scientific community, give us not more than a generation or two to stop despoiling our environment or, alternatively, to contaminate forever the water we drink, the food we eat, the air we breathe, the good earth on which we live.

"We have not less than 30 nor more than 70 years to reverse the destructive trends which a sprawling, acquisitive humanity has created for itself, according to the most competent testimony which our Science Committee has been able to elicit from the forecasters," said Congressman Emilio Q. Daddario of Connecticut. Chairman of the House Subcommittee on Science, Research, and Development, Daddario made an eloquent plea to the House of Representatives for stronger Federal funding of research. He said that after the 30-70-year period it will be too late—"too late to stem the human tide. Too late to control the eradication of resources. Too late to halt pollution of the earth. Too late for anything except to witness the gradual sinking of our standard of living and the erosion of personal liberty."

We are easily blinded by the abundance of our own manner of living. We bask in opulence and believe that everything will continue well forever. We enjoy good health and believe that all peoples can share it. But our high quality of living—fine homes, fast cars, abundant food, rapid transportation, and leisure time—is achieved through wanton excesses of careless exploitation and reckless despoliation. The toll is paid in wasted resources that will deny future generations an opportunity to enjoy even a reasonable quality of life. The extravagant cost is clouded by polluted air and contaminated water, cut forests and depleted soils, a changing climate and a noisier environment. Fewer and fewer species of plants and animals remain to give form, beauty, and diversity to the world. Man seemingly repudiates his evolutionary heritage of natural wonder and beauty, denying to all subsequent generations the opportunity to see, enjoy, and use the rare and exotic

species of plant and animal life once abundant in the world. This is strange behavior for man who has depended and will continue to depend on plants and animals for food, medicine, fiber, enjoyment, and culture.

All soils, waters, woods, mountains, plains, oceans, and ice-covered continents will be occupied and used by man. No single piece of landscape will go untouched in the future. In fact, all will be used repeatedly for as long as man survives. Everything between soil and sky will be moved about, redistributed, and—if experience is reliable—degraded as man continues to exploit the surface of the planet. Man must have industry, transportation, and communication as well as time and space for recreation. Man must burn fossil fuels, convert nuclear energy, harness the sunshine, mine the metals of the world, dam the rivers, pave great highways, expand urban areas and develop new cities. Man must use in some way all parts of the landscape—either for industry, for shelter, for food, for recreation, for transportation and communication or for the preservation of species within reserved plant and animal communities, such as national parks and wilderness areas. But man must learn the wisdom of conservation practices and careful, rational ecosystem management. If the basic human rights are life, liberty, and the pursuit of happiness, and if we have any conscience whatsoever towards the well-being of our children and our children's children, we must take urgent measures soon towards more responsible action. It is unlikely that the qualities of life, liberty, and happiness—each of transcendent character—will continue for future generations in the form we cherish today.

The things we hold dear today may be worthless tomorrow. A devastating thermonuclear war threatens to leave man a grotesque shadow of his former self, associating with multitudes of other badly mutated and inept forms. Although a thermonuclear holocaust would permanently demean the quality of human life, it would represent only a temporary setback in numbers of survivors. Normal human beings

will strive to maintain the species against aberrant millions until reaching a population equilibrium.

Alternatively, and hardly less cataclysmic, is for our destiny to run its course on an earth populated by half-starved, depressed billions gasping in air depleted of oxygen and laden with pollutants, thirsting for thickened eutrophic water, struggling to avoid the constant presence of one another, and, in essence, pursuing life on a degraded subsistence level among men whose numbers are limited not by conscience but by consequence.

A benign exit permits man to escape these choiceless alternatives. It is to maintain a reasonable quality for life by means of population control, rational management of the earth's ecosystems, and conservative use of resources while, at the same time, avoiding involvement in major wars, nuclear or conventional. If these qualities of life are not achieved soon, history will record us as the elegant technological society which underwent biological disintegration for lack of ecological understanding.

### **Principles of Ecology**

If he is to survive, modern man faces the urgent need to understand and live by all basic ecological principles known to science. They must be applied to the management of all ecosystems. Man's persistence in profaning ecological principles is dangerous, serving to foreshorten life and unsettle its stability. We shall examine certain of these principles and the consequences of violating them.

### **Recycling**

A natural ecosystem recycles its mineral resources. Minerals are taken up into the biomass and, on death and decay, returned to the soil. All plants and animals of the world except man are part of an intricate recycling system of the natural habitat which will continue to function well when supplied by energy from the sun. Recycling will never achieve 100 per cent efficiency, but if its present efficiency can be improved, man's life-span on earth, as an industrial organization, will last much longer.

One of man's ugliest habits is his refusal to recycle his resources. He leaves debris of automobiles, cans, bottles, plastics, chemicals, and pavement scattered about the landscape and lets organic refuse of garbage and sewage be funneled into the rivers and streams to be washed to the sea. He does not return used minerals to the factory for reprocessing, nor nutrients to the soil, but draws on new concentrated supplies available in nature. Clearly, such a way of life cannot continue indefinitely. The sooner a major decision is made to recycle, the better off will be future generations and the deeper will be their gratitude to the present generation.

It is not even clear that man can find a way to recycle the products of his socioeconomic system, but he must make a prodigious attempt to do so. It is likely that garbage and sewage will need to be processed and the enriched sludge returned to the fields. It is likely that all metals be recovered when used and reprocessed again and again. Metals are essential for applications requiring high thermal and electrical conductivity, strength and sometimes low density. Man may need to dredge river deltas in order to recover wastes so recklessly abandoned. It is inconceivable that man will continue to exploit nonrenewable mineral resources unless he is willing to substitute organic products for them. Even the use of organic substitutes permanently removes resources from the ecosystem cycle, since these polymerized products refuse to break down by bacterial decay. Severe penalties must be imposed for throwing away anything.

### **Diversification**

Natural ecosystems of forest and stream, grassland or pond, mountain, meadow, or estuary have a diversity of plant and animal species which is the consequence of long, gradual evolution. The natural diversity of species within the community gives the community stability and makes it resistant to change by climate or disease. Man replaces natural communities with monobiotic communities of plants or animals with high productivity, but with vulnerability to climate and infestation. When a hot, dry



"Our village life would stagnate if it were not for the unexplored forests and meadows which surround it. We need the tonic of wildness—to wade sometimes in marshes where the bittern and the meadow-hen lurk, and hear the booming of the snipe."

to function and survive. However, during extended heat and drought, corn and wheat crops die off and leave a scorched earth beneath. Disease infestation can devastate miraculously a standing crop of single species; but with the diverse natural community, only part of it will be struck down and the soil not left exposed. The potato blight and devastating Irish famine in 1845-1847, the Dutch elm disease currently rampant in the Midwest, the Japanese beetle which destroyed many crop varieties, the Colorado potato beetle, and many others are

examples of insect infestation. In the absence of the natural community, the devastation would be complete. The natural world is arranged in a complex web of production known as a food chain. Plants are primary producers and convert water and carbon dioxide to carbohydrates and proteins by using sunlight. In the absence of the natural community, the devastation would be complete. The natural world is arranged in a complex web of production known as a food chain. Plants are primary producers and convert water and carbon dioxide to carbohydrates and proteins by using sunlight. In the absence of the natural community, the devastation would be complete.

#### The Food Chain

The natural world is arranged in a complex web of production known as a food chain. Plants are primary producers and convert water and carbon dioxide to carbohydrates and proteins by using sunlight. In the absence of the natural community, the devastation would be complete.



*"The indescribable innocence and beneficence of Nature—of sun and wind and rain, of summer and winter—such health, such cheer, they afford forever! and such sympathy have they ever with our race . . ."*

*"Our village life would stagnate if it were not for the unexplored forests and meadows which surround it. We need the tonic of wildness—in woe sometimes in merriment, in the blissful and the meadow-lark, and near the booming of the eagle."*





summer occurs, native grasslands and woodlands suffer and some species may decrease in population; but the community of plants and animals continues to function and survive. However, during extended heat and drought, corn and wheat crops die off and leave a scorched earth beneath. Disease infestation can devastate mercilessly a standing crop or single species; but with the diverse natural community, only part of it will be struck down and the soil not left exposed. The potato blight and devastating Irish famine in 1845-1847, the Dutch elm disease currently rampant in the Midwest, the Japanese beetle which destroyed many crop varieties, the Colorado potato beetle, and many others are examples of insect threat to simple ecosystems. Continuity of crops and of a few varieties of shade trees, village by village and town by town across the countryside, makes the spread of insects relatively easy. When anything goes wrong, balance is upset more easily in simple communities of plants and animals than in diversified communities of richer species.

Man has cocked the trigger for widespread disaster by planting vast contiguous areas with one crop. A rust fungus hits a wheat crop and man works desperately to breed a rust-resistant variety of wheat which he then plants over sprawling acres. But another rust fungus strikes this crop when the fungus evolves a new strain. Wise farmers plant many varieties of wheat in alternate rows and thereby discourage any single fungus from attacking the whole crop. An enormous spread of undulating golden grain may please the eye and feed the hungry during the good years; but during dry and windy periods, the full treachery of such practice becomes ominously apparent. At such times, hedgerows and shelterbelts may help redeem the cost of short-sighted crop diversification. Man's clean monoculture of a single crop without interruption is potentially very dangerous. No evidence whatsoever exists today to assure us that once again we may not have massive clouds of dust eroding the landscape if the climate goes hot and dry for several years. As long as man enjoys agricultural surpluses, he can withstand severe shocks to his food supply; but now that population density is crowding closer and closer to the limit of production, man can no longer afford to be a profligate husbandman.

When man destroyed the softwood forests of Eastern Canada, replanting with pure stands of balsam fir, the spruce budworm responded with delight and invaded the region in near epidemic proportions. Ecology teaches us the importance of diversity for landscape practice. A mixed forest of native species may be far more productive and safer over the centuries ahead than pure stands of timber. A single species of plant or animal has unique tolerance limits and whenever climate, mineral or chem-

ical ingredients exceed this tolerance limit, then disaster ensues within the monoculture. (Parenthetically, how much more blessed we would be if, instead of losing entire avenues of elm trees in some of our towns, we might have mixed a few elms with sycamores, oaks, maples, ginkgoes and other species! Even the appearance along the thoroughfare might have been less monotonous.)

### **The Food Chain**

The natural world is arranged in a complex web of production known as a food chain. Plants are primary producers and convert water and carbon dioxide to carbohydrates and proteins by using sunlight in photosynthesis. Herbivores of many kinds feed on plants and convert a small fraction of plant tissue to animal tissue, but with the loss of much stored energy. Carnivores feed off of herbivores and extend the predator-prey food chain to a higher level of organization. Usually, in such a food chain, animals at higher trophic levels are larger and of fewer numbers. On the other hand, the parasitic food chain always proceeds from larger organisms to smaller, since the host must be capable of supporting the parasite within itself. The saprophytic or decomposer food chain proceeds from dead organic matter to microorganisms. Whenever energy is passed through the food chain from one trophic level to another, the second law of thermodynamics levies a huge tax against the stored energy. At the primary level, efficiencies are 1 to 3 per cent. Herbivores may convert energy from the primary level with an efficiency between 9 and 16 per cent. Carnivores may convert energy stored in the biomass of herbivores with an efficiency anywhere between 10 and 20 per cent.

The complexities of food chains are not well understood in quantitative terms; yet it is essential to understand them since they relate to the whole matter of population dynamics and ecosystem stability. All of the fish in the world harvested for food are the end product of a complex aquatic food chain. If any part of the chain is removed or disturbed, the food supply for man is immediately affected.

Man strives to shorten the food chain by replacing the intricate web of natural communities by a simplified crop production. He sprays with insecticides to eliminate predators, often broadcast by the rapid transportation and mass movement of peoples which accelerate the dispersal of plant pests despite rigid controls by Department of Agriculture inspectors. Spraying, however, often upsets the ecological balance of the neighboring region to such a degree that other problems arise.

Pesticides get passed through the food chain to other animals and concentrate at higher trophic





"Sky water. It needs no fence. . . . It is a mirror which no stone can crack, whose quicksilver will never wear off, whose gilding Nature continually repairs; no storms, no dust, can dim its surface ever fresh."

levels. Man has taken precautions to isolate himself from the cycles of pesticides in the food chain, yet the accumulation of these within ecosystems is leading to profound changes of the biota. The argument here is not that the use of pesticides should be stopped entirely, for they have served important purposes. We argue, rather, for evaluation of the consequences of their use to the animal populations of the world. It is not unlikely that selective restrictive use of pesticides is mandatory for the long-range benefit to man, if he is to derive other benefits from the natural communities.

Sometimes man extends a food chain in order to destroy a particular species. So it was in Australia when the prickly-pear cactus invaded the continent and nearly destroyed cattle production. Then the moth, *Cactoblastis cactorum*, whose larvae consume the cactus, was introduced from South America. The moth consumed the prickly pear and saved the cattle industry. If the natural enemies of the moth had been there, the experiment would have failed.

### Limiting Factors

A basic ecological principle is the law of limiting factors, which states that an organism has certain basic requirements for essential materials and environmental factors. An organism may require a certain amount of mineral, yet not be able to tolerate too much. It may require certain temperatures for growth or activity, but temperatures too high or low may kill it. A major challenge in ecology is to discover just what these limits are for a given plant or animal. However, the limit for one factor only has meaning in the context of all the other factors and materials which are essential to the organism. This is an extremely complex problem which ecology has not yet solved except in a general, conceptual way. However, the consequences of the law are seen on every hand as man disturbs the habitat.

All available ecological niches, or positions in the economy of nature, tend to be filled with organisms. During the long course of evolution, plants and ani-

mals developed unique characteristics and physiological requirements in order to fill the entire complex of physical, behavioral, and psychological factors at any given time and place. The ecologist cannot be certain that all possible niches are filled in nature, but they certainly appear to be. When one organism is removed, another one usually adapts to fill the vacant niche. But if several organisms are taken out of the food chain, far-reaching consequences may result. Kill off the insects with pesticides and the bird population may decrease catastrophically. Remove a parasite from an animal which feeds on vegetation and the animal population may explode catastrophically.

The law of limiting factors is seen in the observation that even though food supply is abundant, some single factor of the environment is limiting the number of species. Hence, in the arctic and antarctic oceans, the number of species is few, but the number of individuals of each species is enormous. In the polar regions, low temperatures may be the limiting factor for most species. Desert species are few, of course, where the limiting factor is water. Similarly, the number of plant species beneath the dense forest canopy are few where the limiting factor is light. On the other hand, in the tropical lagoon the number of species is large and the abundance of each is less. In the tropical forest the number of species is enormous but the population of each is low. Every species of the tropical forest is part of an intricate food web where each plant or animal is about to be pounced upon by a predator and each in turn is consuming another neighbor. If one species increases suddenly, others will consume it and keep it in check. The natural ecosystem rarely has the great population explosions that are more characteristic of man-made communities. Where the numbers of species are naturally fewer and the population density of each is greater, the removal of one species can have dire consequences.

If man poisons the habitat or in some way concentrates one factor—such as salt in the soil—the number of species tolerant to this limiting factor be-

come very few. But these few ignite their own population explosion because their predators and competitors do not survive. This is precisely the fate which befell Lake Erie, once clean and clear, now a sick body of water choking with pollution. The fine game fish of Lake Erie are gone, suffocated by lack of oxygen. A few species of algae thicken the shallow waters of the shoreline. Burgeoning masses of pollutants from bordering industries, fertilizers from farms, and garbage and sewage from towns and cities enrich the waters with sulfates, nitrates, and many other chemicals. A few species of plants grow abundantly and huge masses of organic detritus accumulate in the lake bottom to tie up the oxygen in oxidation. Lake Erie is eutrophic and will always remain eutrophic. It is not likely that ever again will anyone see it clean, clear, and productive of game fish. A lake accumulates minerals and contaminants which flow into it and it is nearly impossible ever to remove them from bottom sediments.

Recently, while visiting on Lake Kegonsa near Madison, Wis., I watched a young girl start to water ski. She couldn't get pulled free of the aquatic plants growing in the shallow water. She spent the next few minutes pulling tangled masses of algae and weeds from her skis. Finally, she gave the signal to the boatman to put on the power and take off. Lake Kegonsa, Mondota, Monona, and others near Madison have become classical examples of eutrophication—rich in nutrients, poor in species, rich in algal growth, and poor in game fish and higher members of the food chain. The summer visitor to Lake Michigan, repulsed by the stench of rotting thousands of alewives on the beaches, is witnessing the first danger signals of eutrophication.

### **Changing Climates**

Much has been written concerning man's impact on climate and the apparent warming trend of the first half of the Twentieth Century as the possible consequence of atmospheric carbon dioxide increase. It seems likely that the jet age has brought with it increased cloud cover from jet contrails and a concurrent increase of the earth's albedo. This, along

with the increased dust and pollution haze of industrialized metropolitan areas, may be producing a significant cooling trend of the earth's atmosphere. We do not really know what is happening and, even more seriously, we do not know the consequence to climate of the growth of man's activities during the next century. Climatic changes of incident sunlight, temperature, and moisture will produce gigantic shifts of plant and animal communities in ways now only partially predictable. No one has assessed the changes to productivity of the great agronomic regions of the world nor the costs expected in heating, air conditioning or other creature comforts. The supply of oxygen in the earth's atmosphere is distinctly finite. Lamont Cole, a prominent ecologist, has estimated as well as numbers available will permit, that growth of fuel consumption at the present rate may generate an oxygen-depleted atmosphere within a few generations, particularly if industrial development is rapid in all countries of the world. If there is the slightest likelihood of this occurring, a very thorough study of the situation should be made as soon as possible and a rationale developed for coping with the problem.

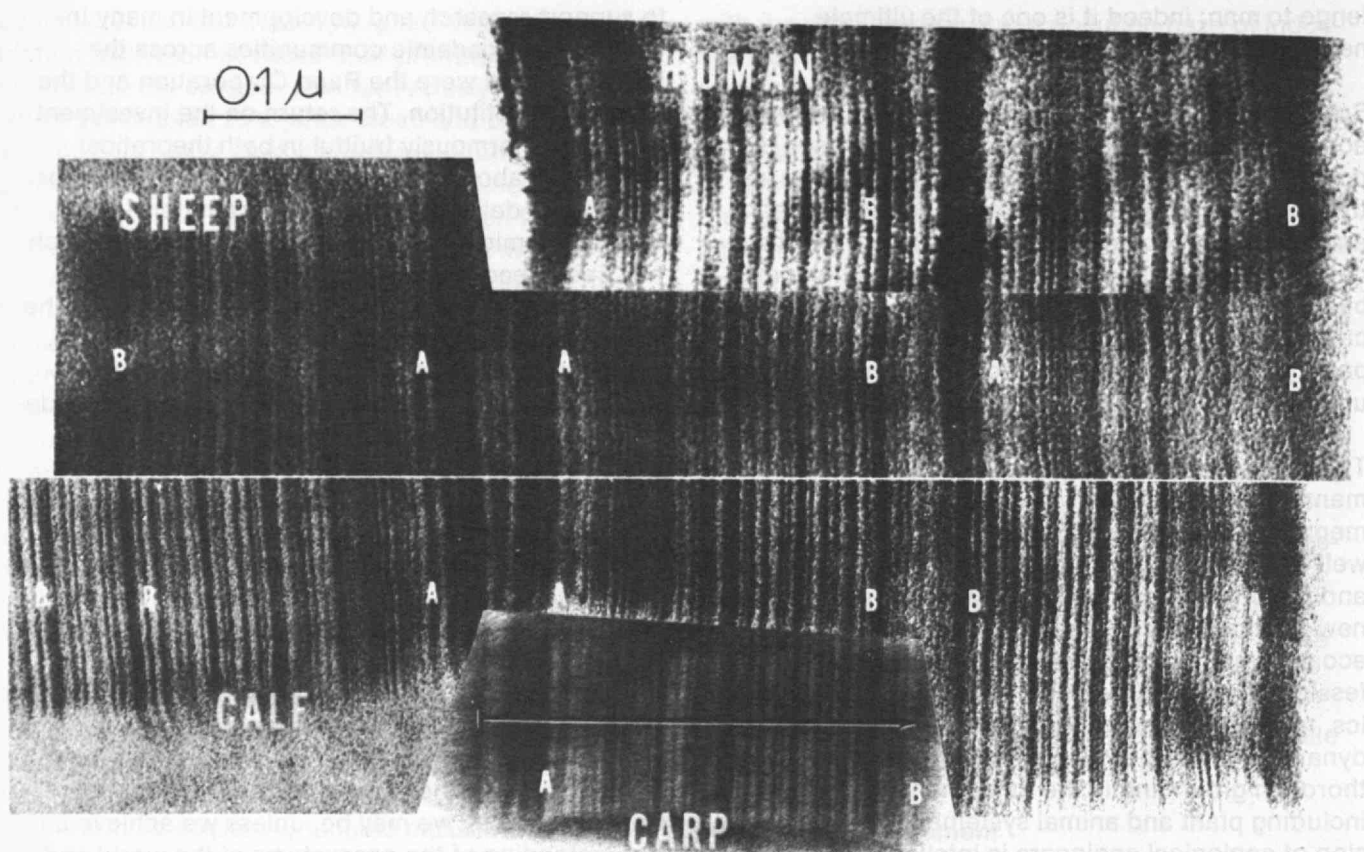
### **Ecosystem Management**

It seems to me that an entirely new profession should be instituted by modern man—the ecological management of the world in which we live. I have sometimes referred to this as landscape management, but it seems to me that "landscape" has the wrong connotation. I suggest, instead, ecosystem management. The entire earth is one giant ecosystem which we can subdivide into as many lesser ecosystems as we wish. An ecosystem is a division of the landscape which encompasses the biota and environment as a unit. A lake is an ecosystem encompassing water, soil, rock, plants, animals and atmosphere, including incident sunlight. A bog, grassland, or forest is an ecosystem as well as a city, village, or farm. An ecosystem is a dynamic unit which is usually undergoing change and within which all objects, organisms, and factors are interacting in various ways. To understand the various ecosystems of the world is an enormous chal-





The long fibrous structure of collagen, upon which Dr. Rubin and Dr. Stenzel capitalize in the work reported here, is shown clearly in this photomicrograph contrasting material from human, sheep, calf, and carp tissues. The arrow indicates the length of the carp molecule, and the vertical stains show the repetitive "cycles" which actually define molecules, head to head, tail to tail, and head to tail, in other species. (Photo: Peter F. Davison)





Science, engineering, and medicine must join to bring new knowledge from molecular biology into clinical significance. Here is an example of how it has been done

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# Collagen as a Biomaterial

The need to replace damaged or absent organs and tissues in medical patients has stimulated an active search for synthetic materials for human implanting. There is no substitute for many tissues, such as kidney, liver and lung; transplantation from a normal person or from a cadaver is the only procedure for replacement. But the functions of certain tissues depend primarily upon their mechanical properties rather than upon their active metabolism, and in these cases synthetic materials have obvious potential for replacing natural ones. In this category are blood vessels, bile ducts, ureters, the cornea and vitreous bodies of eyes, heart valves and possibly even hearts. Other biomaterials are useful in solving other medical problems where actual implantation is not required; major development in this category is that of membrane for artificial kidneys and membrane oxygenators.

To be successful, a synthetic implant material must have certain specific characteristics: it must be nontoxic and well tolerated by the body and not evoke an inflammatory reaction. It must be compatible with blood and not lead to clotting, and it must be relatively stable so that its properties do not change in a biological environment. Many synthetic materials have been investigated but none so far has fulfilled all criteria for an ideal biomaterial.

Biologically derived materials, rather than synthetic biomaterials, offer another approach to the problem of finding suitable substances for these uses, and it may be of special significance.

We have been interested particularly in collagen as a biological material suitable for fabrication into membranes and prostheses, since it can be extracted from animal tissue in large quantity, purified and modified in a number of ways. Initial studies suggest that it indeed may be suitable for many of the medical needs for biomaterials.

## A Scaffolding of Challenging Problems

Collagen is ubiquitous in the animal kingdom, constituting 20 to 30 per cent of total body protein in

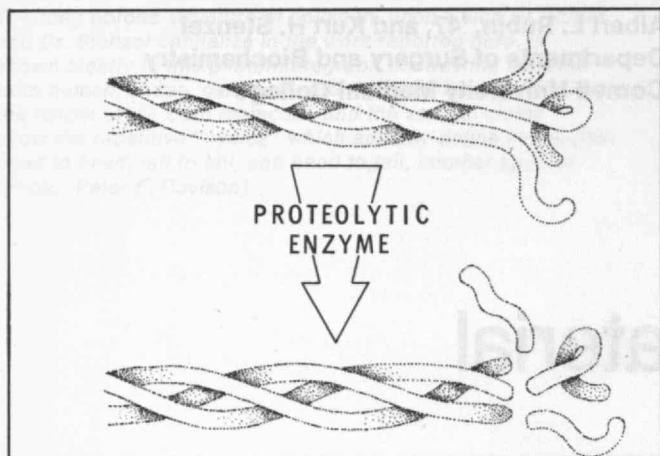
vertebrates. It is a fibrous protein and functions primarily as a supporting tissue and scaffolding for other proteins and cells. It is present throughout the body but is in high concentration in skin, tendon and bone.

Collagen can be extracted from these tissues by a variety of techniques. Perhaps the oldest is to boil the tissue and denature some of the collagen which then becomes soluble in hot water and gels on cooling. This well-known preparation, gelatin, has been prepared for many years and flavored for desserts and other foodstuffs. Unfortunately, it lacks essential amino acids and so cannot serve as an inexpensive source of dietary protein.

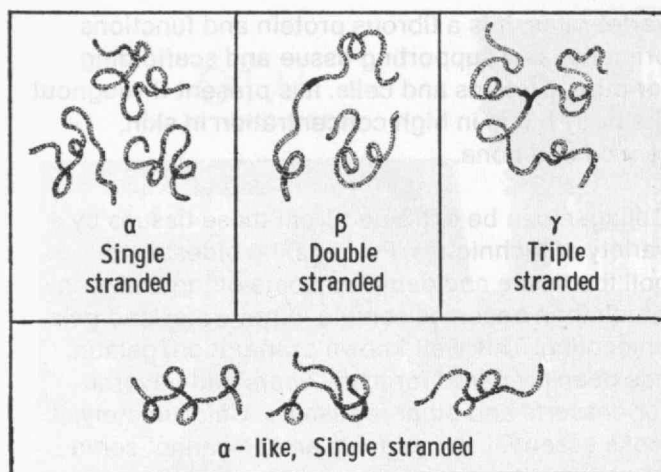
Techniques were eventually developed for solubilizing some collagen without denaturing it. Probably the purest and best studied material is that extracted at low pH, termed acid-soluble collagen (ASC). Physical-chemical studies on this material over the past 20 years by F. O. Schmitt, A. J. Hodge, Ph.D.'52, J. H. Highberger, A. Veis, A. Rich, T. Nishihara and many others have led to a model of collagen as a long (about 2800 Å), thin molecule with three very similar but not identical subunits wound about each other in a triple helix. Electron micrographs of native collagen stained with phosphotungstic acid reveal an orderly array of dark staining bands with a periodicity of 700 Å.

Acid-soluble collagen can be precipitated by a variety of means, such as changes in pH or ionic strength or by the addition of ATP. A periodicity is seen again when this material is viewed under the electron microscope, but this time the repeat is 2800 Å. These studies led to the view that native collagen is arranged in a quarter stagger array ( $2800/4=700$  Å). This type of structuring probably gives greater tensile strength to the biologic polymer.

The three polypeptide strands that constitute monomeric collagen, or tropocollagen (TC), are held together by hydrogen bonds. One would ex-



Collagen has a three-strand helical structure which can be broken down by enzymatic action (left). But destruction of the hydrogen bonds which link the strands reveals remaining covalent cross-links, so that collagen in fact takes the single-, double-, and triple-stranded forms shown below.



pect that when TC is subjected to reagents which result in destruction of hydrogen bonds the molecular weight would decrease by one-third and that three subunits would result. But in fact, however, covalent cross-links sometimes exist between the strands (see figure), so there can be said to be three forms of the material: collagen consisting of single strands, called  $\alpha$  collagen; collagen with two strands linked together,  $\beta$  collagen; and collagen with all three strands covalently bonded,  $\gamma$  collagen. The nature of these covalent cross-links, and how they function not only in the inter-molecular stability of collagen but also in fibrinogenesis and the intra-molecular interactions of collagen, are some of the most challenging problems in collagen chemistry today.

Treatment of collagen with proteolytic enzymes results in several curious changes which have helped illuminate this problem. When collagen is treated with proteolytic enzymes other than collagenase, the molecule no longer polymerizes with changes in pH or ionic strength, and  $\gamma$  collagen tends to change to  $\beta$  and  $\beta$  to  $\alpha$ -like collagen. At the same time, there is no detectable change in molecular weight or optical rotary properties of the protein as long as the enzyme treatment is not carried out when the protein is denatured. The triple helix is no longer present

when the molecule is denatured, and the random coil strands are then susceptible to proteolytic attack.

The probable explanation for these findings is that there exist certain non-collagenous and non-helical parts of the molecule which are susceptible to proteolytic enzymes even when collagen is in the native configuration. These areas probably account for less than 5 per cent of the molecule, but they appear to be most important for the inter- and intra-molecular interactions of collagen. Dr. Schmitt's group at M.I.T., working in collaboration with Lawrence Levine at Brandeis University, has found that these same proteolytic-sensitive areas of the molecule are important antigenic determinants of native collagen.

Dr. Tomio Nishihara, who had done some of the basic work on the physical chemistry of collagen, put this new information on the effects of enzyme treatment to use in extracting collagen from animal skins. He and his colleagues at the Japan Leather Company developed techniques to extract, on an industrial scale, large amounts of enzyme-solubilized calfskin collagen. Before his untimely death in 1967, our group at the Rogosin Laboratories, Cornell University Medical College, worked with Dr. Nishihara to develop and modify enzyme-solubilized collagen for a variety of medical uses, ranging from membranes for artificial kidneys to replacements of the vitreous body of the eye.

Collagen can be cross-linked in a number of ways after it has been treated with enzymes. Most of the chemical reagents used for cross-linking, such as formaldehyde, introduce toxic substituents. Ultraviolet irradiation, however, results in cross-linking of collagen and does not produce toxic photo-products. Thus ultraviolet exposure can be used to increase the tensile strength of collagen materials after they have been cast into the desired shapes. For example, to obtain collagen tubing the material is extruded through a double-lumened nozzle into a coagulating bath for



dialysis membranes, and the tubing is then cross-linked with ultraviolet light.

### Membranes for the Artificial Kidney

The artificial kidney is an example of a biological problem to which collagen may make a contribution. The device is quite simple in operation; it circulates the patient's blood through dialysis membranes which are bathed by an ideal physiologic solution. The membranes must be nontoxic, have a high efficiency for dialysis of low-molecular-weight compounds, allow water to pass through readily across either a pressure or osmotic gradient, withstand pressures up to 300 mm.Hg, and not promote clotting of blood.

Collagen membranes may be prepared in a variety of ways. A mixture of fibrous and soluble collagen appears to give the best qualities for a dialysis membrane, and *in vitro* and *in vivo* testing have shown that collagen membranes can be made to have greater permeability to water and low-molecular-weight compounds than do cellophane membranes. Animal tests indicate that the membranes are nontoxic and so far we have detected no antibody activity to collagen in dialyzed animals' sera.

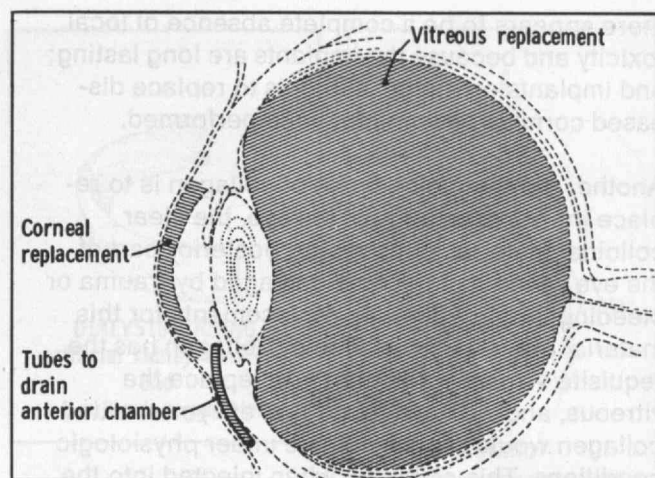
Thus animal and laboratory testing shows collagen membranes to fulfill all the criteria for a dialysis membrane. Collagen has the added advantage, by virtue of its protein nature, of containing many charged carboxyl and amino side groups. These are readily available for reaction with a wide variety of compounds. Heparin, for instance, can be bound to these membranes and may allow dialysis of patients without systemic anticoagulants.

It has been observed that patients do better, in general, when they are dialyzed slowly, rather than rapidly, and several small dialyzing machines have been built for this purpose. The major problem with these units, however, is that they do not remove an adequate amount of water. One of the purposes, then, of developing more efficient membranes is not necessarily to shorten dialysis time but rather to allow for the construction of small, perhaps wearable or implantable units that could be in use while the patient goes about his normal activities.

### A New Approach to Enzyme Deficiency

The ease with which materials bind to collagen brings up the interesting possibility of binding specific enzymes to collagen for the treatment of enzyme deficiency diseases. These genetic disorders have thus far been mainly medical curiosities, although proper dietary management has helped to control the disease in some cases. Enzymes bound, or even encapsulated, in a ma-

*Because antigenicity and blood coagulation are insignificant, the eye is an especially favored place for collagen implants. Corneal replacements, anterior tubes, and vitreous replacements are all promising applications of this ubiquitous biological material.*



terial that is nonreactive and nontoxic would offer a new approach to the therapy of these disorders.

### Implantation and Injection Applications

The problems of toxicity and antigenicity become more important when collagen is implanted or injected in the form of encapsulated material. Our work in this field began by determining, in collaboration with our ophthalmologic colleagues, the effects of collagen placed in rabbits' eyes. Although this is not a good site for determining antigenic reactivity of the molecule, the eye is extremely sensitive to toxic materials. These experiments on the eye also had a great deal of practical interest, since collagen could conceivably function as a replacement for the cornea, the vitreous body, and—in the form of small tubes—as a drainage duct for the anterior chamber of the eye.

Our research showed that clear collagen films implanted in the cornea of rabbits remained clear and showed no evidence of toxicity nor did they excite a vascular response. Some of this material has now been in rabbits' eyes for nearly two years, and there is no ill effect. In fact, it appears that the implant becomes impregnated with host glycoproteins and after about a year either resorbs slowly or is actually replaced with normal host tissue. We are encouraged by these results, in that

there appears to be a complete absence of local toxicity and because the implants are long lasting; and implants on human subjects to replace diseased corneas have in fact been performed.

Another ophthalmologic use of collagen is to replace the vitreous body of the eye, the clear colloidal material in the major, posterior part of the eye which can become damaged by trauma or bleeding into it. Adequate replacements for this material are not now available. Collagen has the requisite viscosity and clarity to replace the vitreous, and we have found that enzyme-treated collagen would remain soluble under physiologic conditions. This collagen, when injected into the posterior chamber of the eye, was also nontoxic and remained clear.

Glaucoma, the result of an increased pressure in the eye due to faulty drainage of the aqueous humor, is a leading cause of blindness in this country. One way of alleviating the pressure which causes glaucoma is to drain the anterior chamber of the eye with small tubes. By extruding collagen (in a device which was constructed for us by Alfred Zwies at Cornell University Medical College), into a coagulating bath and then subjecting the resulting tubes to ultraviolet irradiation, we were able to construct small, firm and nonreactive collagen tubes. These have now been used as implants to relieve glaucoma.

#### **A New Group of Biologically Derived Materials**

The eye appears to be an ideal place to implant useful collagen biomaterials. In other areas of the body the problems of antigenicity and blood coagulation become of more significance. Although collagen is a notoriously poor antigen, antibodies can be obtained from rabbits if the collagen is emulsified in an adjuvant and injected into the toe pads of the animals over a long period of time. Antibodies to native collagen do not react, or react poorly, with enzyme-treated collagen. However, antibodies can also be obtained, albeit with a great deal of difficulty, to enzyme-treated

material. Whereas we know that antibodies to native collagen are species-specific, the cross-reactions of enzyme-treated collagen have not been worked out. The low order of antigenicity of enzyme-treated collagen leads us to believe that this will not be a problem with implants, but only further experimentation will tell.

Although it is appealing to think that removal of the nonhelical regions of the molecule by enzymes results in the lack of reactivity of collagen in biologic environments, there are certainly alternative explanations. The enzymes may well digest any trace amounts of other proteins which are carried along with collagen during the purification procedure, and purity of collagen may be the crucial factor for its tolerance.

Dr. Ralph Nachman of the Department of Hematology, Cornell University Medical College, assayed the effects of collagen films with and without bound heparin on several clotting factors and on platelets. Although collagen has been reported to be an initiator of clotting, there occurred only minimal clumping of platelets with purified, enzyme-treated material. Even this small amount of clumping was no longer seen when heparin was in the collagen films.

Collagen can be made into a variety of shapes that could be useful for replacements of other vital parts of the body, such as are suggested in the illustration on the opposite page. Tubes larger than those used for eye work can easily be made and could possibly substitute for blood vessels, bile ducts or ureters. We are in the process now of constructing heart valves of this material. In fact, once one has a material that is well-tolerated in a biological environment, its medical uses are limited only by developmental ingenuity. Indeed, collagen may represent the first of a group of useful biologically derived materials—materials that have been developed through the arduous and exacting route of evolution.

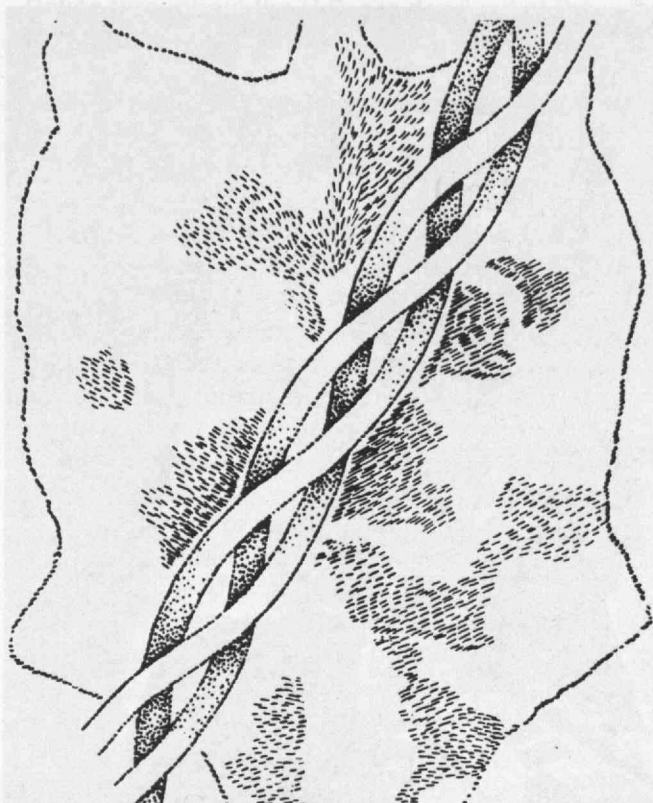
#### **Reducing Molecular Biology to Medical Practice**

The growth of knowledge about collagen and the present attempts to apply this knowledge to biomaterials research and, eventually, to use it in patients have come about through the efforts of many investigators in fields ranging from physical chemistry to clinical medicine. A multidisciplinary approach such as this is of critical significance in reducing to clinical practice the complex and burgeoning knowledge of molecular biology. The development and application of collagen materials to clinical problems is but one example of this reduction to clinical practice of knowledge from molecular biology. The large-scale fractionation of blood by Edwin Cohn and his col-



Collagen is a three-stranded biological material, a fibrous protein which gives form to many living systems and is a principal component of skin, tendon, and bone. It may represent the first of a new group of materials for human implants (eye, grafts, heart valves, and tube and vessel replacements) and for medical appliances and instruments.

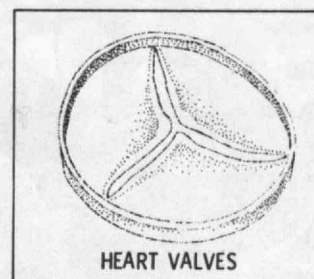
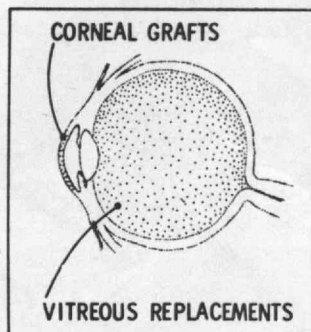
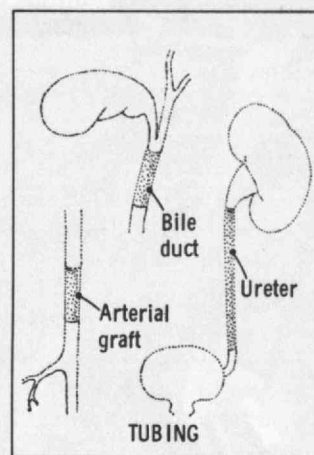
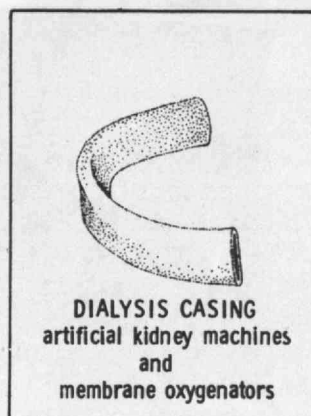
## Fighting Today's Crime with Yesterday's Technology



leagues at the Harvard Medical School during the war was an early example of a successful effort along these lines.

The isolation of the  $\gamma$ -globulin fraction for immunization purposes was a product of this effort. The more practical aspects of such programs merge imperceptibly into bioengineering and chemical engineering. The collagen example is particularly instructive because the protein, due to its macromolecular construction and relative stability, lends itself to such engineering application.

However, in the larger sense, collagen is an excellent prototypical example for control of its deposition and can be investigated by studies of enzymatic reactions, particularly with respect to the peptide chains. This may confidently be ex-



pected to yield information of value in the treatment of arthritic and rheumatoid diseases. In turn, these discoveries will make possible further advances in the bioengineering of collagen. Such feedbacks cannot but strengthen activities in basic biochemical research, clinical programs, and newly emerging programs of bioengineering.

*Dr. Albert L. Rubin studied at Williams College, M.I.T., and Cornell University Medical College, where he has been a member of the staff since 1951; he was a fellow of the M.I.T. School for Advanced Study from 1961 to 1963, working with Francis O. Schmitt, Institute Professor. Dr. Kurt H. Stenzel, who joined the Cornell staff in 1959, studied at New York University and Cornell University Medical College. Dr. Rubin and Dr. Stenzel have, separately and jointly, written many research papers on topics related to the subject of this article.*





**Recommendations of a special Task Force of the National Crime Commission propose using techniques of operations research to speed early apprehension of criminals**

**George A. W. Boehm**

# Fighting Today's Crime with Yesterday's Technology

Police throughout the U.S. are deprived of the basic timesaving tools that relieve drudgery and expand human capability in almost all other walks of life. Automated machinery, computers, precise instruments, and other benefits of modern science and technology are taken for granted by factory workers, office clerks, bank tellers, farmers, miners, housewives, and members of the armed forces. But not by policemen. "We believe we have the most up-to-date department in the country," says Thomas Reddin, Chief of the Los Angeles Police, "but our equipment has hardly changed since I was a rookie in 1941. We are trying to fight the rise in crime with hand-me-downs from our fathers' generation."

The patrol car, for example, is better suited for taking the children to school than for catching criminals. Few police laboratories are staffed by men with college degrees in science. Although police pioneered in the use of radio a half century ago, they still must make do with communications they had in the 1930's. A group of scientists who systematically studied law enforcement for several months reported last year: "Our visit to the police world was like a trip to another technological century."

The police are only partly to blame for this peculiar estrangement. Until recently they have had almost no support to modernize their work. No major department is authorized to spend more than about 10 per cent of its budget on equipment. In most cities and states, civil service regulations put a low ceiling on the number of civilian experts who can be hired and the salaries they can be paid. Moreover, the occasional policeman who wants to specialize in science and technology gets little encouragement and is not likely to be promoted rapidly. As late as 1965 the Justice Department was the only cabinet-level agency of the U.S. government that sponsored absolutely no research and development. While more than 200,000 scientists and engineers are helping solve military problems, only a handful are professionally concerned with

the crimes that injure and frighten millions of people.

Many police officers today are determined to catch up with the rest of society. They are aware that technological deficiencies aggravate perhaps their most serious problem: the manpower shortage that handicaps almost every department. Two years ago the City Council authorized the Los Angeles department to add 5,000 policemen. An all-out recruiting drive last year resulted in a net increase of only 360. Edward M. Davis, Reddin's Deputy Chief, points out: "Even if we could hire the additional men, good administrative practice would dictate giving each man the best tools to work with. It's just sound economics. We're also going to have to recruit good technical brains, and train the ones we have."

The scientists who took the eye-opening trip through the police world heartily agree with Davis. They were members of a special Task Force appointed by the National Crime Commission (formally known as "The President's Commission on Law Enforcement and Administration of Justice") to report on science and technology in law enforcement and suggest improvements. They were drawn from the staff of the Institute for Defense Analyses, the well-known Arlington, Va., "think tank" that specializes in solving problems for the Pentagon. To police work they brought a fresh approach: the techniques of operations research. This highly mathematical method of analyzing organizations and procedures has been invaluable to industry and the defense agencies for scheduling transportation, planning production, and managing complex jobs that demand the utmost efficiency.

The Task Force report, little publicized when it first came out in 1967, was too revolutionary to be accepted immediately by police officers burdened with their everyday routine. "I quickly used a red pencil on my copy as soon as it arrived," says a deputy chief of a large Eastern city, "and I crossed out most of the recommendations. They seemed

impossible because we didn't have the manpower or the money or the authorization. But since then I've had time to reread the report and do more thinking. Now I'm sure we can use most of their recommendations. And God help us if we don't."

A delayed response to the Task Force report has been evident in recent months. The telephone system across the U.S. has designated 911 as a universal number for citizens to report crimes and other emergencies. The use of computers against crime has multiplied manyfold, particularly for identifying stolen property and wanted criminals. And a few major police departments have instituted their own operations research programs.

#### **Education of a Task Force**

The Task Force, headed by mathematician Alfred Blumstein of I.D.A., wanted to be sure of being practical. First, they spent weeks educating themselves in the realities of police work. They visited most of the largest departments in the country, including Baltimore, Boston, Chicago, Los Angeles, New York, San Francisco, St. Louis, and Washington. They rode in patrol cars for hours on end, listening to radio communications and clocking delays due to heavy automotive traffic or overcrowded radio channels. They talked with patrolmen and detectives who were investigating crimes. They visited headquarters command centers to observe dispatchers receive crime reports and direct patrolmen by radio. And everywhere they went, they bombarded policemen with questions.

The scientists learned many items of police lore they had not even suspected:

... On a busy Friday or Saturday evening (peak hours for crime) radio channels are commonly so busy that a man in a patrol car cannot send vital messages to headquarters for a quarter of an hour or more. During this time he may effectively be out of action, or a crisis may develop.

... Fingerprints, contrary to popular belief, are

seldom helpful in catching a burglar, unless he has been so obliging as to leave a full set of 10 prints. Although each print contains a wealth of detail, classification schemes currently employed are so crude that a partial set of prints can belong to any of several hundred thousand people in one of the big fingerprint files.

... Most murders are spontaneous, and many could be averted if police could be rushed to the scene of a dispute before it became violent.

... Forty-nine out of 50 burglar alarms are false alarms, yet police have to waste time responding to every one.

... Many crimes are never reported because people either do not know how to get in touch with the police or don't happen to have a dime to make a phone call.

#### **"Index" Crimes**

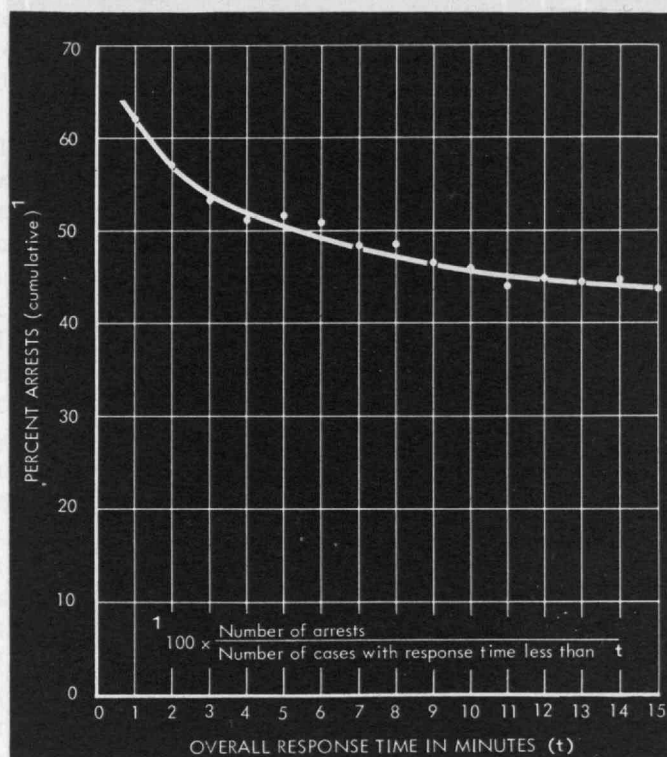
Many major police problems, the Task Force concluded, could be solved by garden-variety technology and common sense. After making their personal observations and collecting statistics, the scientists began an analysis to determine what improvements would be most worthwhile. They concentrated on the "index" crimes, so called because they constitute the F.B.I.'s Uniform Crime Index report. They are the national barometer of crime and are therefore the most carefully reported statistics available. These crimes—burglary, robbery, auto theft, larceny of more than \$50, aggravated assault, rape and murder—represent the bulk of crime in the streets, which had been the Crime Commission's chief concern and is the main target of the new omnibus crime bill.

Now knowing exactly where to focus attention, the Task Force made a preliminary survey of 1,905 index crimes committed in the Los Angeles area. They learned that while only 25 per cent had been solved, 90 per cent of the arrests had been made by the patrol forces. Another striking figure was "response time," the interval between the report of a crime to headquarters and the arrival of police on the scene. For unsolved crimes, response time averaged 6.3 minutes. In contrast, for those cases that ended in arrests, response time averaged only 4.3 minutes. Putting these facts together, the Task Force decided to concentrate on the problems of the patrolman: how to get him to the right spot as fast as possible and how to help him when he gets there.

At this stage, the scientists actually had too many ideas for applying science and technology. Blumstein explains: "It is far easier to imagine and develop devices that will probably be useful than to



The longer it takes police to reach the scene of a crime, the less likely it is that they will make an arrest. "When response time was one minute, 62 per cent of the cases ended in arrest," said the report of the Task Force on Science and Technology for the Commission on Law Enforcement. But "when all cases with response time under 14 minutes were grouped together, only 44 per cent led to arrest."



choose the ones in which to invest a limited budget." The Task Force therefore decided to emphasize machines and methods that have been already proven in industry, business, and the armed forces. They also outlined research projects likely to bear fruit in a hurry. To help them sort out the possibilities, they enlisted a coaching staff, including engineers, fingerprint experts, radio communications specialists, authorities on management methods, jurists, and veteran police officers. Although some of the advisers were unfamiliar with the operations research approach, they worked smoothly with the men from I.D.A.

The Task Force realized that its recommendations would be pointless unless they were in line with police department budgets. So, they made a study of patrol costs in several cities. The findings were almost the same everywhere. The car itself is an insignificant expense. Typically, it costs \$2,000, and

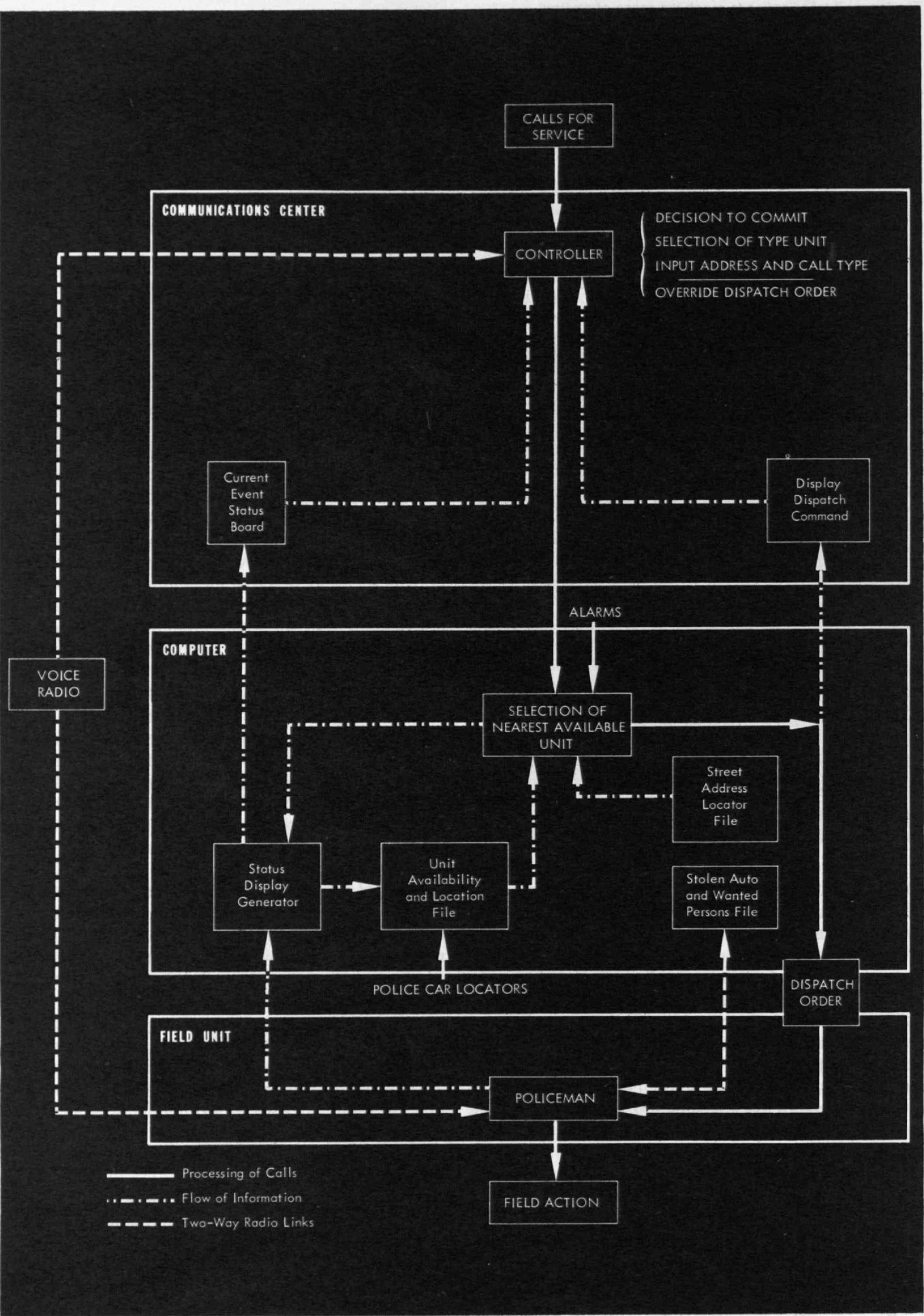
its radio and a few other accessories bring the value up to about \$2,800. The total cost, averaged over the life of the equipment, thus comes to substantially less than \$1,000 a year. On the other hand, keeping one car in action around the clock costs at least \$100,000 annually, mostly for salaries and other personnel benefits. Can modern technology increase the over-all efficiency of a car and its occupants by 10 per cent? If so, \$10,000 is not too much to spend on improvements. After conferring with their advisers, the scientists were convinced that a few specific improvements could increase patrol effectiveness by a good deal more than this 10 per cent, and for much less money than \$10,000.

#### No. 1 Candidate for Improvement: Patrol Car

The first target is the patrol car, a monument to false economy. As Blumstein points out, after having ridden in many of them: "It is the patrolman's office, his taxi, his cafeteria, and sometimes his dormitory." Yet most mechanics who service household appliances drive much better-equipped vehicles.

The patrol car that the Task Force envisioned is still not very elaborate, but it will contain a few extra items such as might be found in a well-managed office. It will have a portable tape recorder for taking down statements from witnesses and a camera for supplementing descriptions of the scene of the crime. At a cost of about \$100 these two simple tools will make a patrolman's report more thorough and more accurate and will also save time. These suggestions were so obvious that the scientists were amazed that cameras and tape recorders are not already standard equipment in patrol cars of any major police department.

Another addition that will prove useful, though not essential, is a radio-teletype machine linked to headquarters. It will be particularly valuable when a patrolman is having difficulty calling his dispatcher owing to busy radio channels and also when he is away from his car and therefore unable





*The Task Force on Science and Technology for the Commission on Law Enforcement proposed this computer-assisted command-and-control system (left) for large city police departments. Telephone calls to police are answered by a complaint clerk ("controller"). He enters the type of incident, address, and priority into a computer keyboard, and he can specify to the computer what police service he believes is required (one-man car, two cars, ambulance, etc.). The rest is then automatic: the computer finds the best car to respond, directs it, and sends it whatever additional information on hospital facilities, stolen car or missing persons files, etc., may be indicated.*

to receive verbal orders over the radio. Mobile teletype receivers, costing \$1,000-\$2,000, have been designed and tested.

The Task Force wants to furnish each patrolman with still another link to headquarters in the form of a personal radio. As it is, a policeman standing on a street corner has no way of knowing about an incident occurring two blocks away, and once a driver leaves his car he is as thoroughly isolated from headquarters as if he were on another planet. Besides, a patrolman who cannot reach a telephone or car radio has no way to call for help except to yell or blow his whistle. Walkie-talkies are being used in most cities, and they have proved invaluable especially during floods, major fires, riots, and other crises when police are widely scattered. But the walkie-talkies on the market today are makeshifts as far as the police are concerned. They are too expensive (about \$800); they are too heavy (more than two pounds); and they are too bulky (almost the size of a cigarette carton). A man who may be involved in a tussle cannot afford to be so encumbered.

Task Force advisers looked over the possibilities and decided the electronics industry could do much better. A radio not much larger than the one Dick Tracy wears on his wrist could be produced in quantity for \$150 with the microminiature circuits commonly used in computers. No company, though, has yet undertaken to develop such a radio. As one engineering manager explained, the market looks risky because police officials might not agree on a standard model. So, the Task Force recommended that the Justice Department get the ball rolling by underwriting development costs and guaranteeing the purchase of the first 20,000 units.

### **Centralized Communications**

Next the scientists turned their attention to the problem of centralized communications. Without intelligence from headquarters, the patrolman can accomplish little. Calculations show that a policeman walking a beat or cruising in an automobile

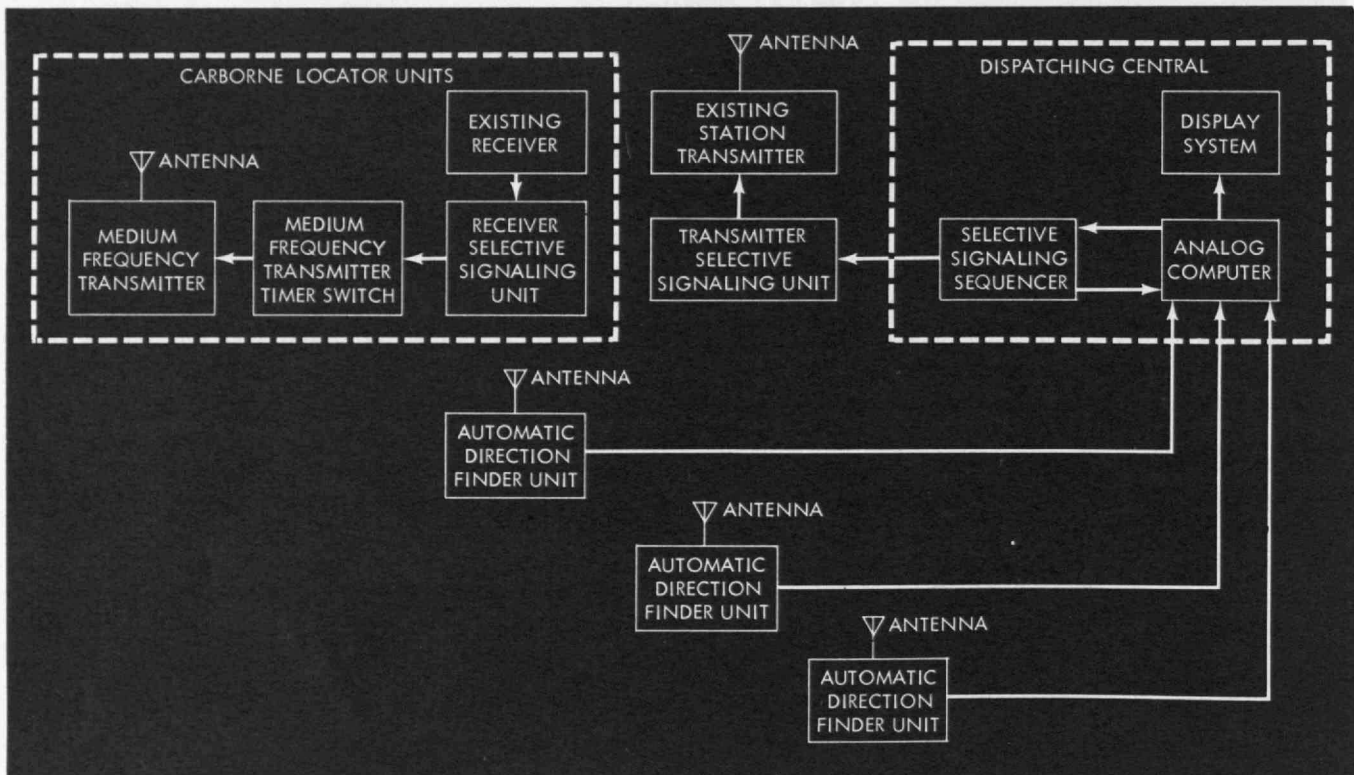
is lucky to observe a street robbery oftener than once in 14 years. Task Force members had inspected the most sophisticated police communications systems in the nation. They observed everywhere that emergency messages are severely delayed at least part of the time. Citizens phoning for help all too often have to wait for someone to answer the phone. The clerk who takes the call usually has to jot down the facts on a form and relay it to a dispatcher by a moving belt or a pneumatic tube. Although the dispatcher almost always gets through promptly with urgent orders for patrol cars, patrolmen on the other end often have to wait for a free radio channel in order to report back, ask for further instructions, or summon aid. The scientists studied the various sources of delay one by one and made their recommendations.

The most obvious step is to make it much easier for a citizen to report crimes to the police. The chances are high that he does not know the direct way to get in touch by telephone. In Los Angeles County, for example, there are 50 different telephone numbers for various police agencies. The Task Force strongly recommended that one specific number be allocated to all emergency calls—fire, ambulance, etc., as well as police. The U.S. telephone companies have already heeded this suggestion. In the near future emergency calls of all sorts can be made anywhere in the country by dialing 911.

The problem of communicating from the patrol car to headquarters is much more difficult. A great many people use radios today—e.g., taxi fleets, school buses, lifeguards, and home appliance servicemen. The part of the radio spectrum most suitable for police work (a band just above 150 megacycles, between television channels 6 and 7) is crammed. In the Chicago Metropolitan area, the Task Force said, 38 police forces with 350 patrol cars all use the same channel.

This situation seemed almost hopeless when Task Force members first looked into it. But their ad-

The proposed command-and-control system for locating and directing police cars would operate with a medium-frequency radio direction-finder system, including a "selective signaling" device to activate the transmitter in each car, three automatic radio direction-finding stations reporting to a computer which delivers the co-ordinates of each car, and a display device to present this co-ordinate information.



visers studied the problems and pointed out ways in which ingenuity and a relatively small investment can give police more elbowroom on the air.

Much could be gained by sharing assigned frequencies and multiplexing them together. This is the technique used in telephone exchanges to serve many customers with only a few lines. It depends on the fact that not everyone is trying to put through a call at the same time. Say that one police department has a single channel and it is busy 50 per cent of the time. Then, by simple logic, a patrolman will have to wait 50 per cent of the time. But if two departments share two channels, the probability of a delay drops to 30 per cent. And if 16 departments share 16 channels, a call will go through immediately 99 per cent of the time, even though each individual channel is as likely as not to be in use.

In some areas additional channels are needed to make multiplexing work. They are, however, not easy to come by.

The New York Police Department recently got a windfall when it was assigned some radio room originally reserved for forestry. The Federal Communications Commission, which allocates radio frequencies, decided that not enough trees grow in Brooklyn to warrant a radio-equipped forest service.

But in Los Angeles last winter the police were turned down when they applied for highway maintenance channels that were not being used locally. Although the State Highway Department had submitted its consent in a formal letter, the F.C.C. replied that "assignment can be made only under the most compelling conditions." Some other attempts to get extra frequencies have been blocked



by the television industry. The National Association of Broadcasters has opposed granting portions of unused television channels to the police, although the Electronics Industries Association has declared that the chance of interference with active television channels is almost nil.

### **Simulated City**

Before putting its recommendations in final form, the Task Force performed an unusual experiment. It was designed to estimate the probable value of each improvement in communications. It was hardly possible to disrupt operations of a busy police department for the purpose of research. So, they invented a city. It had the same population (500,000) and area (100 square miles) as Memphis. Then they devised a mathematical model of police operations in their hypothetical city. They wrote computer programs embodying such features as the number of police cars on patrol, the speed of traffic, the number of public telephones, the rate at which crimes were reported to headquarters, and the number of minutes a patrolman spent on investigation. By altering some of the features, the scientists could calculate ways of paring the response time.

Increasing the number of cars on patrol proved surprisingly uneconomical; a dollar spent saved a total of only 21.1 seconds per year. A radar beacon system that would automatically keep headquarters informed of the exact location of every car would be more valuable. The automatic car locator might cost \$100,000 but it would save 47.5 seconds per dollar. Simply hiring an extra clerk to answer emergency phone calls would be more profitable yet. By reducing the number of busy signals, he would cut delay by 71.7 seconds per dollar.

### **"Instant Cop"**

Surprisingly, the biggest return on investment would come from an innovation so elaborate and expensive that some members of the Task Force hardly dared to suggest it. It is a completely automatic computer-controlled system for dispatch-

ing control cars. Although it would cost well over \$1 million, it would streamline operations so drastically that it would save 119 seconds for every dollar spent. Nothing exactly like this system exists, but its various parts have all been used successfully in the airlines' computer reservations systems and the air defense system. And a new command center in New York embodies many of its features.

A few clerks at headquarters would assist the automatic dispatcher. Upon receiving a phone call or a radio message from a patrolman, a clerk would punch a keyboard that would inform the computer of the location and the nature of the trouble, along with his judgment as to its urgency. Then the computer would take charge. Referring to a built-in file of addresses, procedures, and car locations (instantly updated by the beacon locator), it would automatically radio commands to the car (or cars) nearest the scene and not otherwise assigned at the moment. If a car failed to acknowledge the message within a few seconds—possibly because the driver was at lunch—the computer would order the next nearest car to respond to the call. The system could handle all routine calls by itself; it could even intercept burglar alarms without help from the clerks.

Chief Reddin believes that such a system, if it is ever put into operation, will prove even more valuable than the Task Force's analysis indicates. He is convinced that one of the most pressing problems facing his department today is to make the public aware that the police are prepared to respond rapidly—"instant cop," he calls it. Cutting response time to a minimum will pay enormous dividends in bolstering public morale and discouraging would-be criminals.

### **Franklin Institute Helps Philadelphia Police**

The Task Force report, with its emphasis on computers and operations research, is already changing the outlook of many progressive police officers. Philadelphia recently established a special

*The Chicago Police Communications System includes three-abreast consoles for each of the eight city zones and a large console (right, in background) for dispatching Traffic Division vehicles. (Photo: City of Chicago Department of Police)*



Computer Unit under Captain James C. Herron, who has been taking an intensive electronic data processing course at the department's expense. He is authorized to hire, as consultants, operations research scientists at the Franklin Institute. The Chicago police department has just finished recruiting a small operations research staff of its own and is planning to invest heavily in computer time.

Herron's first task is to improve scheduling. Some departments use rules of thumb in arranging working hours so that extra patrolmen are on duty during peak crime hours and in troublesome neighborhoods. Others do not bother. Jerome Daunt, the F.B.I.'s top computer expert, says that one city has not changed its patrols in many years. One beat now consists of an urban renewal area on which not one building has been left standing. "If they built a reservoir there, I suppose the patrolman would have to swim," he comments.

Herron wants to base scheduling on a detailed crime forecast, which would include for each part of the city for each hour the rate of every major

kind of crime. He and Franklin Institute scientists have begun to plan a computer program for making predictions automatically. They are going to include the characteristics of various neighborhoods and also such variables as time of day, the day of the week, barometric pressure, and even the phase of the moon.

After that, Philadelphia would like to use operations research to reassess how much of their budget they should be spending to combat prostitution, homicide, traffic violations, burglary, and other specific kinds of crime. As Blumstein observes: "All crimes are not equally undesirable. Most people would be willing to tolerate a considerable amount of private gambling, or perhaps even shoplifting, if they knew that doing so would reduce the amount of street robberies."

#### **National Crime Information Center**

Highly sophisticated technology also can help police perform their routine duties. It has been doing so, in fact, at a rapidly increasing rate during the last few months. Take the experience of Trooper



# Children's Science Is Another Culture

John K. Cassidy of the Maryland State Police. Last February 28, while patrolling a stretch of highway near Glen Burnie, he turned off the road for a mid-morning coffee break. As he approached a motel, he spied a gray 1966 Oldsmobile sedan with Florida license plates parked outside one of the bedrooms.

Trooper Cassidy had no definite grounds for suspicion, but still he had an uneasy feeling that something was wrong about the car. For one thing, few Floridians visit Maryland in the dead of winter. At 10:47 he radioed a description of the car and the license number to his headquarters at Pikesville. At 10:48 back came the reply. The car had been stolen a few days earlier, his dispatcher said. The probable thief was an escaped convict. He was likely to be armed; extreme caution was in order, and more state troopers were on the way.

Within a few minutes six more patrol cars converged on the motel. When Cassidy and his fellow officers burst into the motel room, they surprised four men, who surrendered tamely. A search of their baggage turned up four sawed-off shotguns. Later it was found that all four were fugitives.

Such occurrences are becoming commonplace all over the nation. In some instances several crimes are cleared up simultaneously, when wanted criminals are caught with cars, guns, or other property stolen in different places. These successes are due to the National Crime Information Center, a computer file that the F.B.I. began in January, 1967. It was from this file that Trooper Cassidy got the information to make his multiple arrest. N.C.I.C. now lists more than half a million entries, consisting of stolen property identifiable by serial numbers and dossiers on wanted criminals.

Any police department connected to the computer can add or look up information almost instantaneously. A policeman simply sends a message to the computer with a special electronic typewriter linked by cable to Washington. So quickly does the

computer search its random-access-disk file that the requested information is typed back automatically in 30 seconds or less.

The N.C.I.C. network started with typewriter terminals in 15 police departments and has been expanded rapidly. Soon it will tie together law enforcement agencies of all 50 states and 25 major metropolitan areas, the Secret Service, and the Royal Canadian Mounted Police. "Hits"—that is, crimes solved by this instant information—will exceed 1,000 a week by early next year.

Smaller regional networks have been started in the San Francisco Bay area, Los Angeles, Philadelphia, and New York. They supplement N.C.I.C. by including minor offenses of purely local concern, even traffic violations. Thus, a patrolman who stops a motorist for passing a red light can inquire by radio while writing the traffic ticket. Without wasting a minute or harassing anyone, he finds out whether the car or its driver are wanted locally. And since all information in all the networks is filed in the same code, the regional computer can check directly with Washington to learn whether the car or its driver are wanted elsewhere.

Recent progress has made it clear that modern science and technology have a great deal to offer to law enforcement and that police can make excellent use of the best tools available. Yet the public and the administrators who control police budgets are still hardly aware of what is happening. In a nation deeply concerned about crime, the police need help to come abreast of the times.

*George A. W. Boehm is one of the nation's pioneer science writers. He has held positions with the American Chemical Society, Newsweek, Scientific American, and Fortune, and is now writing on a free lance basis.*

*"The lighter spool won against the heavier. I don't know why but it did. So now I know that the lighter spool goes faster."*

*"I tried it again and the heavier won one so I'm not quite sure which one will win."*

*"I found out Galileo was right. I tried a light spool and a heavy spool and they both fell pretty identically. I didn't think they would fall at the same time because I thought since the heavier one was heavier it would win by all means."*

*The Chicago Police Communications System employs three manual consoles for each of the eight city zones and a large console (right, at background) for dispatching Traffic Division vehicles. (Photo: City of Chicago Department of Police)*





# Children's Science Is Another Culture

The traveler, the Peace Corps volunteer (both outward bound and returning), the suburbanite in the ghetto and the black man in the white man's world—all suffer from something called "culture shock." Each of us lives mostly within a world filled with the familiar: landmarks, symbols, a language that seems "right." Whether we were born to our situation or acquired it, there are one or more cultures in which we feel at home, within which we accept events, structure our perceptions, and surround ourselves with the familiar. The rest of the world is alien and to some extent threatening: when we venture outside our culture we must face foreign words and thoughts, we must rescreen our perceptions, we must cope with a new situation.

The world of science is a culture in itself. Those of us who were trained in it feel at home with a particular set of ideas, understand a certain manner of speaking and share a set of values about methods for approaching the world around us. We are scientists. We believe in our culture so much that we want to expose children to it; we want them to understand the world of science.

Mostly we expose our children to science through techniques and gadgets which have the quality of exporting our culture and asking children to cope with it. This is very much like traveling around the world on T.W.A. flights, staying in Hilton Hotels and meeting the natives in American bars. The inhabitants of the countries have to deal with us in terms of American customs, and we see them only as they do or don't succeed in this enterprise. From the results of this effort, we cannot evaluate or even understand their culture.

When we take science to children, we usually do so by introducing our kind of activity, modified to suit the children only in the sense that the Hilton Hotel will be built of local materials and won't need central heating in the tropics. The language we use is a little simpler, the materials we introduce are safer, and the apparatus is cheaper, but we

give to the children books and materials that have the form and, to a great extent, the content of academic science. Then we measure their response. Do they become stimulated to do science, i.e., do they do experiments that we recognize, do they enter the science fair with a nifty display, do they ask our kinds of questions, and do they come up with our kinds of explanations? We never find out what they would do if we approached them on their terms and encouraged them to pursue their own concerns.

## Exporting the Adult World of Science

If we do open our eyes, look out of the alley windows of those imposing hotels, or talk to children about what they are interested in and able to discuss, we find that theirs is indeed an alien culture—one that is strikingly different from that of the science departments of the university and the industrial laboratory. The child's world is alien when viewed from the perspective of the science culture. But we have to remember what "alien" means: it is foreign to us but not to its locale. What the children express when they explore the world, the activities they pursue and the interests they show are native to their state. They just happen to be different, in some sense, from the discipline of science as we recognize it.

Just how are children different in their approach to the world? What does in fact happen when a scientist goes into a classroom prepared to do science with children?

One way to describe this is in terms of particular experiences with one set of children. Last winter, for example, some of us from Elementary Science Study visited a fifth grade classroom with the beginnings of a unit called "rolling objects." The basic equipment consisted of an inclined plane and a number of cylinders, spheres, and other objects that could be rolled down the slope. The children were asked to compare the ways the different objects moved down the inclined plane—a fairly standard physics experiment, on the whole, and

# Children's Science Is Another Culture

one for which we might be able to predict the results. But in the children's hands the experiment turned out quite differently from what we had expected. The result was, I think, quite revealing of what concerned and interested these children. What they did demonstrates what they saw and how they interpret the world.

The first thing that kids did in this class, when presented with an inclined plane and a number of objects that could roll down it, was to race these objects against each other.

"Which is the winner?"

"Mine is the fastest."

The competition element was intense. It was reflected between children; but more than that, it permeated each child's view of his own work. If one thinks about a child's life—the activities, the pressures, and the rewards—it turns out to be natural to describe things in terms of races. That is the way the world is. Given such a world view, it is natural for the child to place this particular activity within his common framework and describe his results in terms of that framework.

After watching the children persist in these races, no matter what other questions we tried to ask and no matter in what direction we tried to lead them, we began to realize some of the implications of this mode of thought. One of the consequences of thinking of natural events as "races" is that you tend to ignore the ties. Ties are not important; they don't tell you which is faster. And indeed we had many children tell us that A was faster than B, because they had raced the two 10 times and A won twice, B once, and there were seven ties.

Is this bad science? It certainly isn't what is generally considered a proper way of looking at and interpreting events. But the observations are good (at least there is no reason to question them), and the conclusion follows nicely: if you are going to describe the set of experiments in terms of a

race, then A did win—just as Detroit won the pennant, not by winning all the games, but by winning more than any other team.

Yet we recognize that this kind of description is alien to us as scientists. What is missing? What kind of argumentation is not there? The answer is that these children do not have a statistical view of data and scientific observation. Instead they have a particulate view. Each observation has its independent existence, each observation could decide the contest. The whole set of concepts required in order to design an experiment based on the idea that the results of science have a probability, rather than a certainty, the whole notion that null readings or "ties" are valuable ways of obtaining data—these are extremely sophisticated concepts, and children simply do not have them.

The point is not just that notions about probability and the way our adult science culture interprets data are alien to the children, but that these views have to compete with a world view that is already firmly set. The world makes sense in terms of races, in terms of competition. You can summarize and explain your results (and, therefore, remember them and use them to predict) by finding out which one is faster (and not counting the ties). So to change the focus, to shift the attention to the ties and consider the other events as experimental oddities require that the child change his mental set. That, as we know, is hard for anyone to do.

Another area in which children's approaches are very different from what we might expect is simply the particular individual experiments that children decide to do. An inclined plane and a series of cylinders and spheres suggest to a physicist that he compare the time it takes for various objects to roll down and measure the effect of such variables as mass, shape, and center of gravity. Children do spontaneously study these things, although they use different words to describe what they are





doing. But they also get interested in a number of other variables. If you in the role of parent or teacher try to push a particular result that you believe can be obtained—say the independence in the rate of rolling on the mass (for identical distribution of mass)—you run into two problems. First, the results are not likely to be very clear unless you take a great deal of trouble with the apparatus, and, second, even if the results come out as you expect, they do not seem to convince the children very much. How can that be? How can they see a result come out as it “should be” and not be impressed by it?

The answer is, of course, that you can only be impressed by a result if it confirms or denies the thesis that you held to begin with. If you were indifferent to the thesis, or just didn’t know it, you are hard to impress.

### The Various Criteria of Validity

What most children do seem to know is that physical events, such as the time it takes a cylinder to roll down an inclined plane, are affected by a number of variables. They may even know roughly what it means to study one variable at a time, or at least to limit the number of variables which one examines. What they don’t know is how to do this kind of limiting, and especially they don’t know which variables to concentrate on. What affects the rate? Is it temperature, mass, altitude, shape, time of day, the teacher’s mood, the observer’s tie in the way, or Johnny’s jiggling of the board? There is a bewildering array of factors which could enter in.

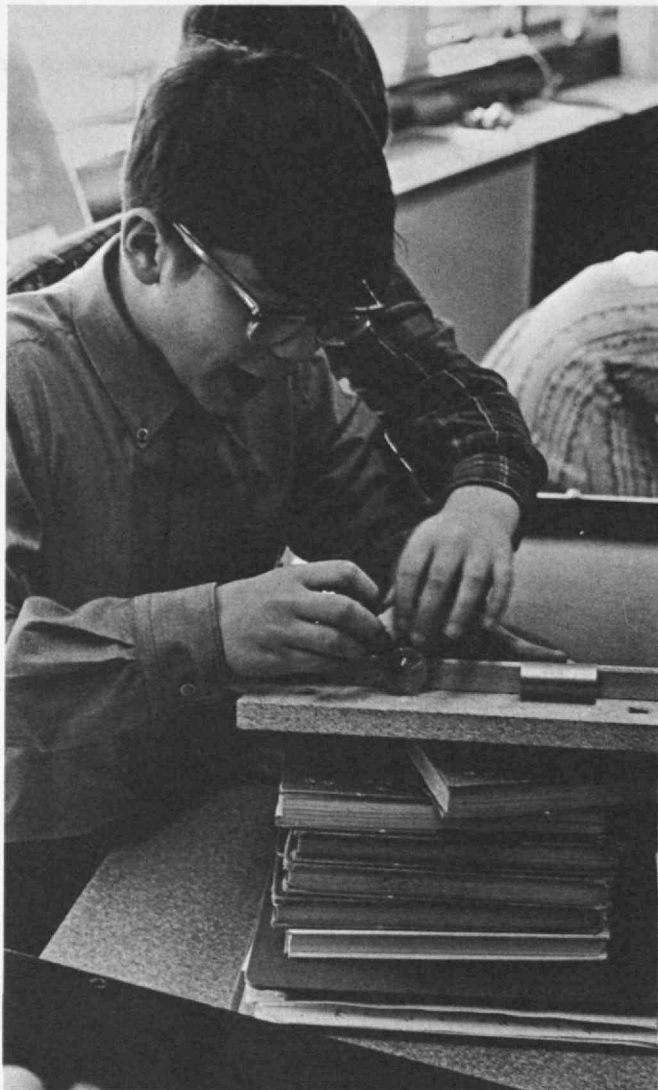
In the scientist’s laboratory work, the problem of deciding what factors are relevant is solved in two different ways. First, we build apparatus which tests only a very small number of variables at a time. We enclose things in boxes, thermostat them, and probe with electrical circuits which essentially screen out many of the variables that we are not interested in. Secondly, and more important, we have a pretty good idea of the order-of-magnitude effect of a number of factors on experiments.

Gravitational attraction is simply not significantly affected by temperature, humidity, noise, and a number of other things, over ordinary ranges. We can discount these things in concentrating on the area of interest.

We usually don’t have trouble in recognizing a friend of ours if he has just had his hair cut or is wearing somewhat different clothes. We are so familiar with him that these variations can be discounted. But let our guide in a foreign country appear the second day in a different getup and we become confused. Faced with a wide range of new perceptions, we have trouble picking out the relevant ones, trouble organizing what we see to make sense out of it. In a similar way, children have this difficulty. Because they don’t know what is important and what isn’t, they have a terrible time devising experiments which scientists would consider significant.

The complexity of the situation is brought out even more when we take into account the problem of error that is involved with most of the equipment that we choose for “science” experiments. If we happen to let the cylinders roll “incorrectly” (that is, if we release them at different times accidentally), if we bump the board, or introduce any one of a number of “extraneous” factors, we automatically discount the experiment and do it over. But the child has no prior knowledge of what is “incorrect” or “extraneous,” so he counts a number of experiments that we would reject and may discount others which appear valid to us. He ends up with a pile of data which may make no sense because he does not have the preconceptions that one needs in order to place them in an adult scientific framework.

How does one handle piles of data that make no sense? It is almost impossible to resist the temptation to explain them in terms of some theory or concept that one already has. That is precisely what children do. They take a number of experiments which include the inevitable error, impose



on them the selective perceptions which result because they are not sure of what counts and what doesn't, and end up with data which will support any theory which they happen to hold. And if you ask what theory that is, it turns out to be, by and large, a kind of Aristotelian physics. The basic belief relevant to these experiments is that—as in most things that matter in the child's world—weight makes a difference: heavier things hurt more if you drop them on your toe, they are harder to lift and harder to throw, and they do more damage to whatever they hit. So why shouldn't heavy objects roll down slides faster too?

If that is the conclusion that you expect, you can very easily reach it from the experiments. What about all the times this was not the case—all the times when the heavy and the light thing rolled at the same rate? First of all, the ties don't count. Secondly, many of the experiments that did not support the Aristotelian thesis may have involved the extraneous factors discussed above. Finally, in a great number of cases it is true that, other things being equal, the heavier object does get to the bottom first. Of course, this is good Aristo-

telian physics, too. Galileo's objects dropped from the Tower of Pisa didn't strike the ground simultaneously; the heavier got there first by a little bit. His argument was much more sophisticated than that.

The children got stuck, just as generations of scientists did, on the fact that the heavier objects do behave differently from light ones under most ordinary circumstances. The children reinforced this belief when they tried to devise tests to decide which object did, in fact, roll down the board faster. The children thought of ingenious methods for doing this. One group had a child place his fists at the end of the board, close his eyes, and report which hand was struck first by the rolling object. Another group invented a balance with a pencil that tipped in one direction or the other, depending on which side of the balance first felt the impact of the rolling object.

Unfortunately, both these methods can be influenced by the mass of the object used. The hand test is sensitive to the force of impact, and the balance is prejudiced towards the heavier object if both objects strike it at nearly identical times. This is a case in which the children's ingenuity and cleverness happened to reinforce their prejudices and the theory they held. It is extremely difficult for anyone to resist accepting data which fit his theory and, more than that, are gathered with the help of a specially constructed device that happens to "work." We are all familiar with the kind of control experiments we run: if they come out as we expect them to, we seldom repeat them. Only if they come out in a way that appears odd, do we recheck everything carefully.

### **The Choice Between Exports and "Going Native"**

I have tried to describe in the preceding pages the results we had in working with a group of children using a rather simple physical setup and testing what appeared to us to be a relatively direct physical situation. It turned out that the children, when left to themselves, viewed it as a complex situation;



and when they tried to order it, they reinforced the notions that they already possessed instead of using the opportunity to expand and modify their views. How do we, as scientists or parents, handle this common situation? There are a number of points which can be made.

It may appear at first thought that the problems which came up in this class are not really so important. One could argue that much of our difficulty arose simply because the particular experiment chosen was a difficult one and we were trying to do the job with inadequate equipment. But I don't think that more sophisticated gadgetry or a more tightly controlled experimental situation would provide much of an answer. True, the difficulties were particularly noticeable in this situation, but they are there whenever we introduce our science to children.

Every experimental situation with children presents the same problem. Either the experiment is simple, direct, and with nothing that can "go wrong," or else it is open and fallible. But in the former case, it is simply a lecturer's demonstration placed in the hands of the children; it is not an experiment.

We have to make a choice. We can decide to export our science culture to our children or we can decide to "go native," to find out what the children are doing, and to encourage them to develop their interests, their concerns, and their approaches. In either case, our goal should be to do what we can to make them good at what they are doing. By "being good at it," I mean to allow them to have satisfaction in the results of their activity. In the former case they will presumably become good at adult science; they will learn "our thing."

If we decide to do the former, we know what our goals are fairly clearly; the task is easier because we have our own standards for comparison. But this is offset by the fact that there is no reason why any large number of children should be

turned on by our activity or should want to be good at what we want them to be good at. In fact, given the relations between adults and children these days, there is ample reason to believe that just because this is an activity that we adults endorse, the kids, at the least, will look at it very critically.

Whichever course we decide to pursue, we should be clear and honest with the children about what we expect of them and what we think of their work. If we really believe that the children should devise and perform their own experiments, then we have to be willing to face the consequences of this decision. The kids are likely to do things that we consider trivial or even misleading, and they are likely to arrive at conclusions that we do not accept. We must either put up with this or else recognize that we propagandize and direct them. We can make them get the results we want, but this will require limiting the materials we give them and "guiding" their experiments so that they will perform the ones that we consider important and that give us *our* answers, too. In this case, we should be honest and make it clear that we are insisting on *our* science, not letting them do *theirs*.

We must recognize how much we usually demand of children; we know that "changing one's set" is extremely difficult, that the history of science is full of examples of people who could not change their minds even when confronted with contrary evidence, and it is difficult to suppose that this should be any easier for children.

Finally, I think it is important that we try to free ourselves from our prejudices and recognize that what children do, even if it reinforces beliefs that we think are wrong or involves experiments that we think are trivial, may be good science.

### **From Preconception to Insight**

I have indicated that asking children to adapt themselves to our scientific culture is easier for us scientists than trying to acculturate ourselves to our children. It should be obvious that from the



"I thought the bit steal tub not hollow would win against the same size tub but not the same wait."

The best we can hope to accomplish by the more rigid teaching is to train technicians, to prepare students to work within the confines of the theories and beliefs which are current during the years that they are learning.

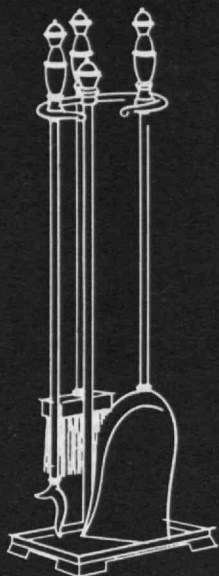
If we are interested at all in helping children to become creative, to have the breadth of knowledge, the strength of mind and the critical ability to go beyond accepted beliefs, then we must give them the kind of start in life that helps them go beyond present viewpoints and come to new understandings, new insights and new concepts. They must be able to think and act on the basis of their own experience, not on the basis of a world which consists of testing and confirming present ideas. The more we make the scientific work of children a game in which our beliefs are the goals, the harder we make it for them to go beyond present views. The more we respect their science culture and try to understand it, the more likely we are to equip them to look at the world through their own eyes rather than through ours—to interact with it as it is rather than as it "should be."

children's point of view the opposite is the case. But is it worth it? Should we go to the trouble of learning those aliens' language, taking their awkward customs seriously, and entertaining their puzzling notions?

Yes, I believe it is desirable and indeed necessary that we make this effort. We cannot really claim that we have gone beyond rote learning and uncritical memorization if we simply substitute our set of cause-and-effect relationships and our set of activities which support them for those we learned a generation ago. As long as we decide what a child will get out of a particular experiment and accept that result and not others as a measure of the success of the task, then we have not changed the age-old relationship between parent or teacher and child—the relationship in which one hands down the sacred truth to the other. If we insist that children learn and accept Galileo's laws concerning falling bodies from the results of their experiments with inclined planes and rolling objects, then one of two things will happen: Some children will lose interest in science because they will recognize that we do not really honor their experiences but accept only that part of it which fits our notions. Others will become docile adherents of the science we have taught them.

George E. Hein is associated with the Elementary Science Study program of the Education Development Center in Newton, Mass. He has taught chemistry and worked on research at the University of Michigan, California Institute of Technology, Boston University, and Harvard Medical School; his interest in teaching children began, he says, when he realized "that education problems were just more exciting and relevant to me and to the world today than research on enzyme specificity." The photographs are from Elementary Science Study, E.D.C.





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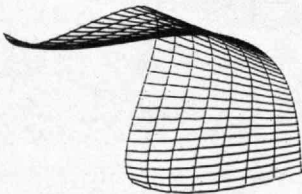
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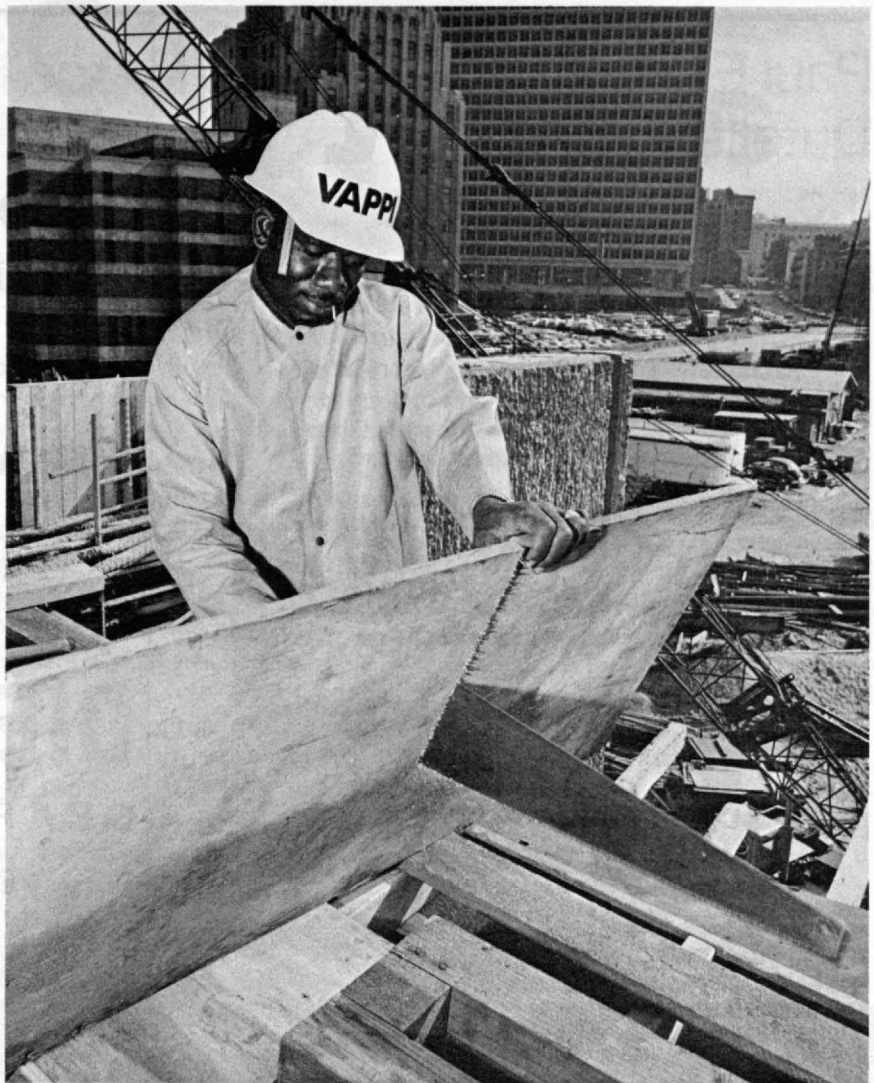
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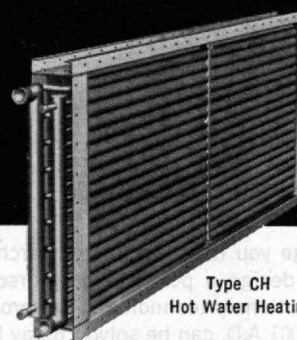
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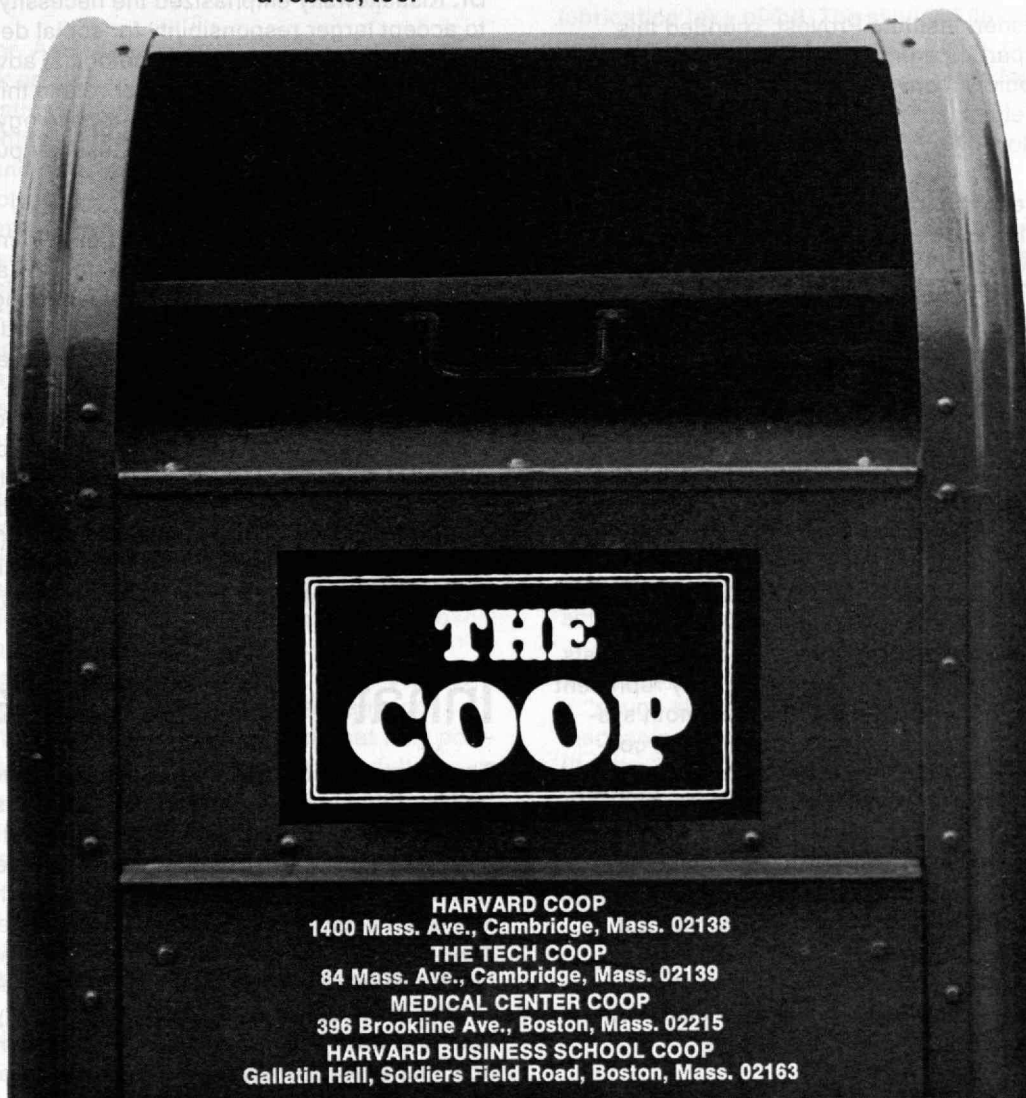


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# Trend of Affairs

## A Systems Analysis of Science and Society

We are at a point, if we haven't passed it already, when we can no longer afford to be complacently happy about a new technological development without first asking where our technology is going and what we want to do about it.

Jerome B. Wiesner, Institute Provost, sounded this warning while participating in a television panel on science and society, convened this fall by the American Chemical Society at its first Northeast Regional Convention in Boston.

"With the processes of burgeoning technology becoming larger and larger, we have serious problems on our hands unless we ask whether we are in control," Dr. Wiesner said. "We have been satisfied to take a new discovery and put it to work with little consideration of its relationship to our total socioeconomic objectives. We now have no rational method for doing this. Technology assessment is good, but we must go farther. As scientists, we have a responsibility to look ahead and ask what are the purposes of the technological inputs into our society."

Dr. Wiesner's admonition was set within the framework of a relatively new portrait of the productive interchange of knowledge that is taking place today between scientists, scholars, legislators, and industrialists. In combination, these men and the forces they represent become, in effect, the mechanism of a mammoth systems-analysis structure within the United States concerned with interfaces between science-technology and society. The names and associations of the other panelists help fill out this portrait—Emilio Q. Daddario, Chairman of the House of Representatives Subcommittee on Science, Research, and Development; George B. Kistiakowsky, Professor of Chemistry at Harvard and former Special Assistant to the President for Science and Technology; and Arthur R. Kantrowitz, Visiting Institute Professor at M.I.T. who is Vice President and Director of the AVCO Corporation.

"Dr. Wiesner was really the man who gave impetus to my own efforts to obtain a better assessment of

proposed directions for particular technological advances," Congressman Daddario said, "when he suggested we should have a kind of early-warning system against the dangers of pollution. Since then, the National Academy of Sciences, through its Committee on Science and Public Policy, has entered into a contractual relationship with my subcommittee and we now have a better handle on science-and-technology affairs."

Dr. Kistiakowsky emphasized the necessity for scientists to accept larger responsibility for social decisions that hinge upon the thrusts of technological advance. "If we, as scientists, play our proper role in this larger social context, making inputs to technology assessment, we are likely to minimize the mistakes of purely scientific decisions."

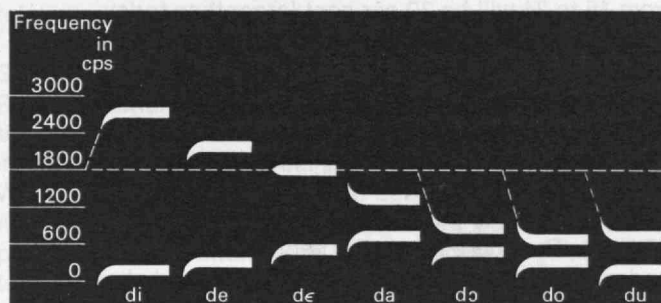
"The question is whether we are going to manage technology or let it manage us," said Dr. Kantrowitz. "We must grow from a position of accepting moral responsibility for the results of science and technology to a position in which we accept a role of responsibility for the total social system. The key issue is communication between science and society. I propose three ways to institutionalize this process: (1) separate questions that are scientific from those that are political, (2) make sure that statements made on behalf of science are free from political bias, and (3) expose to public view these interchanges between scientists and politicians to help citizens reach better decisions."

## Innate or Acquired?

There was a time when linguists and psychologists believed that speech was a collection of discrete, invariant sounds which could be disassembled and analyzed, just as words can be disassembled into various letters and combinations of letters of the alphabet. But when engineers developed sophisticated instrumentation in attempting to design a voice-writing machine they discovered that this simple view was wrong: every speech sound is influenced by its context, and when the human listens to speech he somehow manages to analyze and make sense out of an extremely complex set of sounds. How and when does he learn to do it?



When you speak a word which includes the letter "d," the energy you utter may vary over a range of 1200 c.p.s.; the consonant takes on the frequency characteristics of the vowel associated with it. To make spoken language intelligible, a human hearer must somehow learn to compensate for these contextual effects, to hear a "d" every time it is intended. Now evidence suggests that this ability is fully developed by the end of the first four months of life, long before language acquisition begins. Is it a natural endowment, innate in every human, or a skill learned rapidly by infants in their rich acoustical environment?



Jerry A. Fodor, Associate Professor of Psycholinguistics at M.I.T., took as his example for a recent Harvard psycholinguistics lecture the hearing problem involved in identifying the letter "d." Humans, he said, hear this sound as a "d" even though the range of energies involved in it may extend over 1200 c.p.s., depending on the vowel associated with the consonant. Even children are able to make this complex analysis quickly and dependably. How, and when, does a child learn that the "enormous" frequency differences are to be ignored when he seeks to identify the consonant? Is this ability innate, or acquired? Can psychologists use this phenomenon to study the learning processes in the youngest children?

These questions led Dr. Fodor to an experiment. He let three- and four-month-old infants hear a consonant sound in various contexts. When babies in one group identified a sound correctly, they were treated to a visual experience—a movie projected briefly. There was a control group exposed to sounds without the learning reward. The result was evidence that even at this age infants are able to identify consonants no matter what the associated vowel sound, that they possess the same sound perception system as adults.

The experiment does not show, Professor Fodor emphasized, that this sound perception system is acquired before birth. But it does show that if the system is not innate to the human organism it is at least acquired very rapidly and very early. Though psychologists have been reluctant to do so, Dr. Fodor declared, "one has to begin to entertain the possibility that the human is in fact biologically adapted to the world in which he lives—that he is prepared at birth for a three-dimensional environment remarkably rich in acoustical and visual stimuli."

# Friction and Arthritis

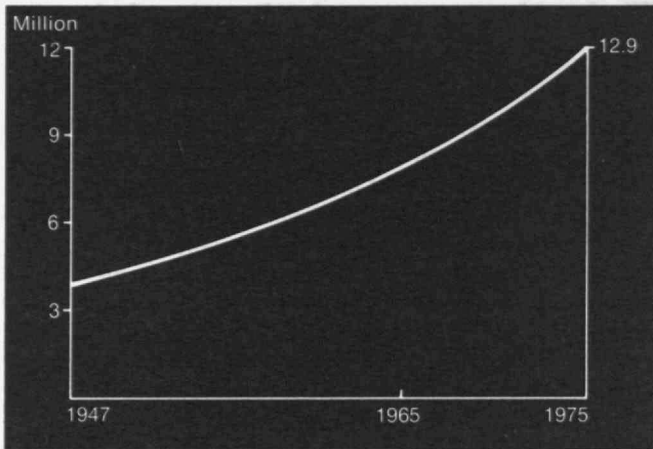
Studied from an engineering point of view, mammalian joints are remarkably good devices. At best their coefficients of friction are "incredibly low," matching and bettering the best ball bearings that man can make, Dr. Eric L. Radin of Massachusetts General Hospital told an M.I.T. Engineering Projects Laboratory seminar this fall. But in old age, what seems to be "wear and tear" sometimes sets in, in the form of arthritis, and the effort to conquer arthritis may benefit from a better fundamental understanding of how a mammalian joint can be so nearly frictionless.

This line of thought has led Dr. Radin to a co-operative project on joints and friction with Igor Paul, '60, Assistant Professor of Mechanical Engineering at M.I.T., in which the Institute's Engineering Projects Laboratory is co-operating with Massachusetts General Hospital.

The work is only beginning. But already it is clear that several mechanisms work at once to achieve the perfection of nature, according to Dr. Paul. Bones in mammalian joints are covered with cartilage which secretes synovial fluid, and Dr. Radin and Dr. Paul now believe that, in engineering terms, two kinds of lubrication take place. The synovial fluid provides hydrostatic lubrication just as a film of oil lubricates bearings, and the cartilage itself provides a supplementary polymeric lubrication of the same type that teflon offers for mechanical devices.

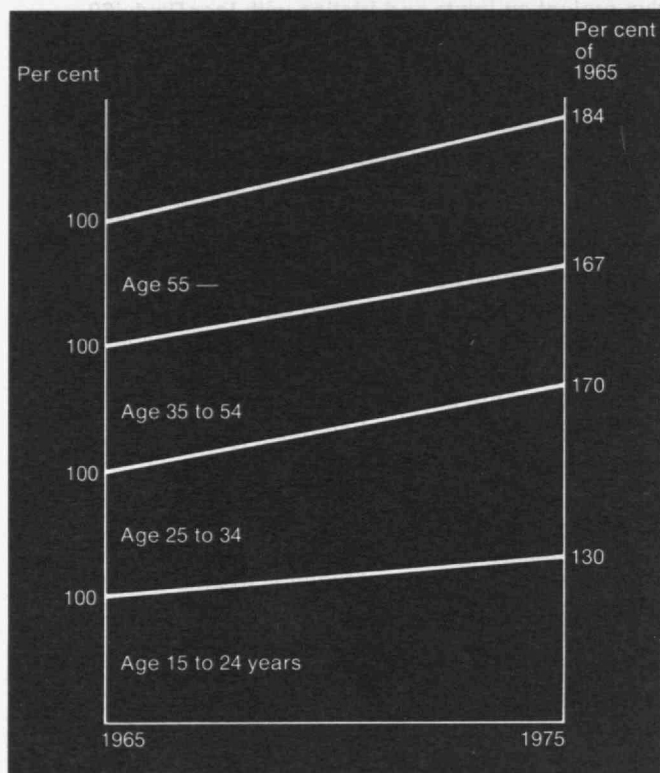
To extend their studies, Dr. Radin and Dr. Paul are now developing a new research apparatus to study in detail the mechanisms and function of mammalian joints. An elaborate system of weights and mountings will be used to reproduce as nearly as possible the conditions under which the ankle joints of cows operate, and sensitive gauges will show the friction, surface velocity, and amount of deflection of the actual joint mounted in the apparatus under different conditions and with different lubricants. The problem is difficult because the natural force on the ankle joint has both vertical and horizontal components which together may amount to over 1500 pounds; and the coefficient of friction in the ankle itself is lower than can be achieved in the joints of the apparatus.

But there is at least some primitive evidence to suggest a "sound similarity between arthritis and a squeaking mechanical joint," says Dr. Paul, and if you presume that there is a wear problem involved in arthritis it is reasonable to study mechanical analogs in seeking its solution.



*The impact of advancing education on the U.S. labor force: By 1975 there will be more than 12 million professional and technical employees available to U.S. business—but there may be fewer professional managers to capitalize on this great resource.*

*The changing distribution of the U.S. population; By 1975 there will be fewer Americans in the "matured" age bracket to provide active management for increasingly sophisticated industries. But those industries must capture the interest and loyalty of increasing numbers of increasingly sophisticated young people, said Charles A. Myers, Sloan Fellows Professor of Management at a Sloan Fellows Convocation at M.I.T. this fall.*



from 15 to 24 will be 30 per cent larger than today. "Their expectations in an affluent society will be like those of their counterparts today," said Professor Myers, "with all that means for management in recruiting and motivating young people" with a superfluity of options.

There will be a 40 per cent increase in the age group 25 to 34. These are the young people "whose behavior and values today have resulted in much head-shaking by their elders," said Professor Myers, "and managers will have to tolerate considerable diversity in those they hire in the next decade." Indeed, he said, the hardest challenge to business may be to "provide opportunities which will interest this group enough to contribute their efforts enthusiastically to organizational objectives." Four out of five of them will be high school graduates and one-fifth will be college graduates; they will be better prepared and have greater expectations in their careers. But at the lower end of the scale will be a minority "underclass" of 7 per cent with less than eight grades of schooling "whose educational handicap for the world of work will be especially severe."

And the older age group—55 and older—will increase by 17 per cent in 1975. This suggests, says Professor Myers, that industry may do well to "re-examine rigid compulsory retirement policies" and perhaps to look toward post-retirement part-time employment policies to capitalize on this increasing source of experienced talent.

The result will be, Professor Myers told the Sloan Fellows, that in 1975 "proportionately fewer managers will have to recruit and develop more better-educated younger people as compared to 1965, review employment and retirement policies for the increasing number of older workers, and at the same time do their share to remove educational deficiencies for the lower end of the occupational scale."

## Management and the Coming Generation Gap

Men who serve as managers in the next decade will need all the help they can get—from psychology and technology alike—to keep ahead of the numbers game. For by 1975 there will be an absolute decrease in the U.S. population between 35 and 54 years of age, the prime age group from which most top managers will be recruited, Charles A. Myers, Sloan Fellows Professor of Management, told a Sloan Fellows Convocation at M.I.T. this fall.

And while this age group will be smaller, there will be more of both youngsters and oldsters to challenge management with new demands for employment and new opportunities for profit. In 1975 the age group



# Interferometry, Infrared, and the Birth of Stars

Although U.S. astronomers are facing lean years ahead in terms of new observing facilities, they are at least learning to use the facilities they have to best advantage. By linking radio telescopes in tandem, they are closing in on the universe with amazing precision—precision, in fact, that rivals that of their optical colleagues. M.I.T. astronomers are in the forefront of those applying this new tool, known as long-baseline interferometry, to problems as diverse as tests of general relativity and the birth of stars.

Science writers attending a briefing at the National Radio Astronomy Observatory in Green Bank, W. Va., this fall heard about the frustrations of radio astronomy in this country during a year of belt-tightening. Sander Weinreb, '58, formerly of Lincoln Laboratory and now at N.R.A.O., summed up the contrast between support for radio astronomers in Europe, where large new telescopes are in various advanced stages from drawing board to actual construction: "At the present rate," he lamented, "we'll have nothing started for years."

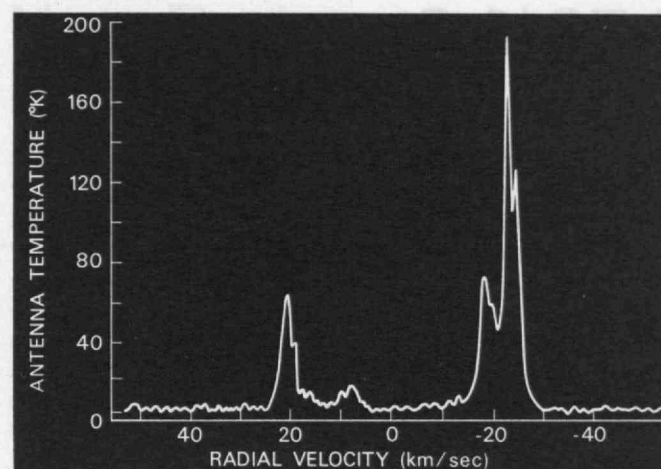
But there is still plenty of work in progress. Some of the most interesting of it is based on the fact that, when it comes to the ability to distinguish between two objects close together in the sky, two telescopes are better than one. Thus radio astronomers in North America, and colleagues overseas, are each turning their radio telescopes simultaneously towards small sources of radio waves in the sky.

Basically, explained David E. Hogg of the N.R.A.O., this process of radio interferometry is analogous to simple optical experiments in interference. By recording radio signals from a source with two telescopes at precise times, radio astronomers can build up an interference pattern.

At present, according to Marshall Cohen of Caltech, radio astronomers have brought their resolution down to one thousandth of a second of arc—equivalent to the size of a postage stamp viewed across the Atlantic. This precision has been achieved by using widely separated telescopes—notably by link-up of instruments in California, Massachusetts (Lincoln Laboratory's Haystack radar), Green Bank, and Sweden.

The technique is currently being put to the test in an array of experiments sponsored by M.I.T. using the 140-foot telescope at Green Bank and the Haystack radar, some 500 miles away. One experiment will involve yet another test of Einstein's General Theory of Relativity. Irwin I. Shapiro, Professor of Geophysics and Physics, and Bernard F. Burke, '50, Professor of Physics, will attempt to measure the angular separation of two quasars, 3C 273 and 279, as the sun passes across the sky close to them. According to the Einstein theory, the sun's gravitational field should bend

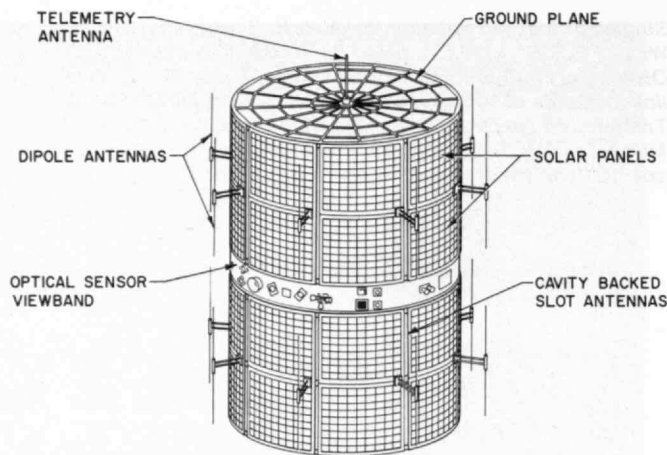
Studies of infrared radiation by Alan H. Barrett and William J. Wilson, E.E.'64, of M.I.T., using the National Radio Astronomy Observatory 140-foot telescope in Green Bank, W.Va., have linked clouds of hydroxyl radicals with young infrared stars. The infrared spectrum below, showing radiation at 1612 MHz from NML Cyg, includes the strongest radio emission spectral line yet detected (approximately 190° K).



the radio waves from these sources as it nears their position in the sky, thus changing their angular separation. The question is whether the technique and the instrumentation it requires will be accurate enough to confirm the actual phenomenon.

Another experiment in the M.I.T. package concerns young infrared stars.

Radio astronomers have recently suspected that these stars, probably in early stages of star birth, are accompanied in space by clouds of hydroxyl radicals (which consist of an atom of hydrogen and an atom of oxygen). In the August 23 issue of *Science*, Alan H. Barrett and William J. Wilson, E.E.'64, of the M.I.T. Center for Space Research, reported that they had identified hydroxyl clouds with four out of 20 infrared stars surveyed with Green Bank's 140-foot telescope. Dr. Barrett and Dr. Wilson are now using the Haystack-Green Bank interferometer to search the neighborhoods of some 500 infrared stars for evidence of hydroxyl radicals. They hope, too, that the new measurements may help explain the physical properties of these peculiar gas clouds and provide new insight into the birth of stars.—Peter Gwynne



## LES-6 Stares at its Earth Target

Nobody tells LES-6 to keep its place in line—it is self-disciplined. LES-6 (the sixth Lincoln Experimental Satellite) is the first satellite ever launched that senses its own location in orbit and keeps itself above a fixed point on the earth. Earlier synchronous satellites have been kept in position by command from ground stations.

Launched successfully on September 26 at Cape Kennedy, LES-6 is maintained in synchronous orbit 22,300 miles above the equator by its own self-contained station-keeping system. Designed and built by M.I.T.'s Lincoln Laboratory, LES-6 is the latest in a series of satellites developed for Lincoln's Air Force-sponsored research program in space communications.

LES spacecraft are designed to test realistically, in orbit, advanced devices and techniques for possible use in military satellite communication systems. Surface-terminal equipment also developed under the Lincoln program includes the recently announced "TATS" (Tactical Transmission System) (see *Technology Review*, Oct./Nov., 1968, p. 65), a frequency-hopping modulation device that permits many messages to be carried simultaneously by a tactical communication satellite. Besides being the first satellite with a completely automated, station-keeping system, LES-6 is unique in two other technical features:

1. A high-efficiency electrical power-supply system enables the LES-6 radio transmitter to produce the maximum possible RF power output throughout the lifetime of the satellite: for several months after launch, this technique provides twice as much RF power output as could be produced with conventional power converters and regulators.
2. LES-6 is equipped with the first electronically despun, switched-beam UHF-band antenna system, producing circular polarization to eliminate fading, and concentrating the satellite's radio energy on the earth to produce stronger signals at ground terminals.

In addition, LES-6 can be moved from one position to another by an automatic station-changing system, actuated by ground command.

The outer surface of LES-6 is covered with solar cells except for a 6-inch-wide band around its equator where some 22 optical and infrared sensors and other devices are mounted; the only battery aboard is associated with a low-power clock which must continue to operate whether or not the satellite is illuminated by the sun. Satellite electronics are mounted on a stiff, flat, circular honeycomb platform inside the sensor band.

LES-6 will be used in experiments to aid development of a tactical satellite communication system for the Department of Defense, a program in which Lincoln Laboratory is providing design and technical assistance to the Air Force. Like its predecessor LES-5, launched in July, 1967, LES-6 operates entirely at assigned frequencies in the UHF communications band, which is used for a wide variety of U.S. government communications services; this band extends approximately from 225 to 500 megahertz.

LES-5 made possible highly successful, unprecedented worldwide tests of direct radio communication via satellite among Army, Navy, and Air Force units, including ships at sea, aircraft in flight, and portable and mobile ground terminals. These first tri-service satellite communication tests covered distances of more than 8,000 miles.

LES-6 is cylindrical in shape, approximately five and one-half feet long and four feet in diameter, and weighs about 360 pounds. More powerful and of much more advanced design than LES-5, the satellite will handle more than 10 times as many simultaneous users. It is spin-stabilized, with its spin axis perpendicular to the orbit plane (parallel to the earth's polar axis). It carries a self-contained automatic spin-axis orientation system and additional provisions for adjustment of spin rate and spin-axis orientation by command from the ground.

LES-6 carries a radio-frequency-interference (RFI) experiment to measure the strength of UHF-band signals coming up to the satellite from the earth at frequencies between 290 and 315 megahertz (MHz). LES-5 carried a similar experiment, covering the adjacent frequency range from 255 to 280 MHz. Both of these RFI measuring instruments were built by the Laboratories Division of the Aerospace Corporation, conducting the experiments jointly with Lincoln Laboratory.

In addition, LES-6 carries other experimental equipment, including a radiation measurement experiment to determine spatial and temporal variations in the earth's radiation environment at synchronous altitude.

LES-6 will be used by the services for direct radio communication via satellite among aircraft, ships, and ground terminals of the Army, Navy, and Air Force.



## Political Cultures

India and China—alike and yet different: alike in having had sophisticated, ancient civilizations, in size, population, and state of development; very different in social and political structure and ideals. Under these conditions, is the same approach to political modernization and development suitable or even possible for both?

No, answers Lucian W. Pye, Professor of Political Science at M.I.T., in a report published by the M.I.T. Center for International Studies. A "technical approach" to the problems of modernization might suggest a different answer, he admits, but the overwhelming differences in political cultures make it apparent that each country must maintain its own style of modernization.

India, says Professor Pye, has reached a "crisis of identity": from the tangle of modern, secular, scientific views and traditional religion-oriented ones Indians are unable to select what they feel to be truly Indian, and without a consensus in ideals and principles they are not able to act effectively. Diversity and contradiction are tolerated partly because of historical circumstances, but also because of the modal Indian personality: Indians have strong feelings for moral ideals, but they lack the aggressive traits needed to enforce them or the strong super-ego to live up to them themselves.

China, on the other hand, is in a "crisis of authority." The Chinese psychological inclination is for uniformity, hierarchy, and discipline, and these feelings have been intensified in this century by the disorder of civil wars and foreign invasions. "The Chinese have an uncommon sense of revolution," writes Professor Pye. "They do not seek to overthrow existing oppressive authorities in order to realize greater freedom but rather to denounce the ineffectiveness of what exists and to demand a more powerful and more absolute authority."

Professor Pye sees lack of political unity as the greatest problem facing the introspective and tolerant Indians. Central issues are likely to be whether the democratic process can maintain unity and whether central authority can make and enforce decisions. In China, on the other hand, "the feeling that power should be monolithic is likely to clash with the need for ever greater divisions of labor and specialization."—*Paul C. Wilson*

## New Environment Look in Washington

Environmental management is getting to be everybody's "thing" today, but the Federal-agency environment is apparently not the simplest one to manage. Credit Washington with a big try, however, in its recent announcement of a consolidation of several agencies which seek to manage man's environment. Heretofore going their separate ways, these agencies are now regrouped into the Consumer Protection and Environment Health Service (C.P.E.H.S.) within the Department of Health, Education and Welfare.

C.P.E.H.S. is actually an in-house reorganization, pulling together three H.E.W. units—Food and Drug Administration, National Air Pollution Control Administration, and the Environmental Control Administration—at the direction of H.E.W. Secretary Wilbur J. Cohen. Its new administrator is Charles C. Johnson, Jr., an Iowa engineer with long experience in public health services. Some index to the comprehensive nature of the responsibilities of C.P.E.H.S. is evident in a partial listing of its functions:

... A program to assure that foods, drugs, medical devices, and cosmetics sold in interstate commerce are safe and effective for the purposes claimed by the manufacturer, and are honestly and informatively labeled.

... Shellfish certification and product safety activities (formerly conducted by the National Center for Urban and Industrial Health of the Public Health Service).

... Pesticides research (formerly conducted by the Communicable Disease Center).

... Poison control activities (formerly conducted by the Bureau of Health Services).

... A national program for air pollution prevention and control including leadership and assistance to state and community control programs.

... National radiation air surveillance (formerly conducted by the National Center for Radiological Health).

... Programs of research, demonstrations, training and assistance to states and communities designed to control a wide variety of environmental hazards.

... Programs involving solid wastes disposal, occupational health, water supply and certain sea resources, urban health planning, arctic health, and epidemiological phases of injury control (all formerly conducted by the National Center for Urban and Industrial Health of the Public Health Service).

... The *Aedes aegypti* (mosquito) program (formerly conducted by the P.H.S. Communicable Disease Center).

The intra-bureau rearrangements brought about by Secretary Cohen might profitably be projected to an inter-agency reordering of organizations responsible for resolving environmental problems. The H.E.W. realignment still leaves the Federal-agency environment in an unconsolidated state. Agriculture administers a sizable program for consumer protection; Interior is responsible for water pollution control; Commerce administers the Environmental Science Services Administration; Housing and Urban Development seeks to renew and beautify the urban environment; and the relatively new Department of Transportation, among its other duties, tries to improve the overcrowded environment of air terminals. Mercurial and insinuating, the environment defies confinement within any neat package.

## Politics of Space

Can any single nation apart from the Great Powers mount an effective program for exploring and using space? Is such a space program in fact a force for international co-operation or for nationalistic competition?

These were among the questions raised but not answered at an American Institute of Aeronautics and Astronautics conference in Washington early this fall. Judith Ann Tegger of the M.I.T. Political Science Department, reporting on the political and social implications of the French space program, may have put the large issues in a small context and so made them more visible.

The global nature of outer space exploration, which at first led many to conclude that national space programs could be positive vehicles for international scientific co-operation, seems sometimes to have an opposite effect, Miss Tegger said. For as the commitments of talent and funds increase as programs inevitably become more sophisticated, there is "reluctance to share both technological and prestigious benefits with other nations," she pointed out. The result is that national political interests grow and political interference becomes a "significant element in program planning."

Thus, Miss Tegger told the A.I.A.A., "a national space program can become an instrument for buttressing nationalism as well as a more positive implement for international co-operation."

The French space program, she said, has now reached this stage. Its origins were in a multi-pronged effort of French leadership to achieve both international influence and national modernization and thus allow France control over her own destiny. It was to be a vehicle for "integrating the business and education communities with the government bureaucracy," for giving the government a basis for major research and development commitments and thus for "effectively controlling the direction of science and technology as a whole." The French program had significant early accomplishments, Miss Tegger said, but now, having achieved international stature, it is becoming more an instrument of national policy.

Now the French confront a practical problem: As money grows tighter and the space program increasingly sophisticated and thus increasingly expensive, it becomes harder to justify its large expenditures without some financial returns. And the demands of the program require the specialized resources—large boosters, for example, that only a few nations have. "Ironically, France—expecting to lead Europe in a space program—finds that she must now go to her European neighbors for assistance," Miss Tegger said. "And every indication is," she added, "that enough aid will not be forthcoming," at least in the near future.



# Inflation versus the G.N.P.

When the new President enters the White House on January 20, he will inherit an economy that has been cooled but apparently not supercooled by the tax surcharge and government expenditure ceiling enacted by Congress in mid-summer 1968. The rate of increase of the gross national product has been reduced (from \$20 billion in the first and second quarters of 1968 to probably \$15 billion in the last quarter), but the restraint which economists expected from the tax increase and government-spending lid just has not fully materialized.

"It is an unusually difficult year for forecasters," admitted Paul A. Samuelson, Professor of Economics at M.I.T., at a joint meeting of M.I.T. and Harvard graduate students in business management this fall. But, "I have a very sensitive nose. Restraint *will* work, even though it will not work as demonstrably as we expected," he said.

Earlier estimates of how the economy might be "cooled" are being faulted, said Professor Samuelson, by three factors:

1. Estimates were based on some assumptions about the rate of federal government expenditures. But the government is not a free agent in controlling its expenditures; this year's bumper wheat crop means more price-support expense, the Vietnam war is still exceeding cost estimates, and the Czechoslovakian occupation has brought additional military commitments. The fact is, said Professor Samuelson, that estimates of federal expenditures today tend to be too low.

2. Though most economists have been talking about tight money, the money supply actually has been growing; "it is hard to reconcile freer money with declining gross national product," said Professor Samuelson.

3. Business volume is better than expected, because savings rates have been lower than expected.

If your constituency is elderly people, said Professor Samuelson, you would regard with optimism the slightly

restrained economy which will greet the new President, because it promises to reduce the rate of inflation.

"But if your constituency is young people and especially underprivileged people, then this is a gloomy forecast indeed," Professor Samuelson told his audience, because it anticipates an increase of perhaps 2 per cent in unemployment—and such an increase will be felt first by workers with low seniority and marginal skills.

"A mixed economy such as ours likes a little inflation," he said. If unemployment threatens to grow and profits languish, the new President will be under tremendous pressure and "what Congress does it can undo."

## Laser Mini-Pulses

The pulse of energy emitted by a solid laser is short and intense. But there are also extraordinarily small variations (mini-pulses- $10^{-12}$  second) within the envelope of a main laser pulse, and the interesting and puzzling aspects of these "specks" of light are now the subject of research by Peter Schweitzer, '59, at the Air Force Cambridge Research Laboratories.

The occurrence of mini-pulses is unpredictable—as is their duration and the number in any sequence. The relation of solid laser mini-pulses to the somewhat longer ( $10^{-9}$  second) pulses familiar to experimentalists working with gas lasers is also uncertain. But it is Schweitzer's view that all these tiny aberrations have a common origin and that they may eventually be controlled and made to benefit users of many kinds of lasers. His theory is that they result from mode-locking—the occasional positive interference of the various modes or frequencies which together comprise the output of a laser.

To test his theory, Schweitzer proposes an experimental set-up in which laser light travels in a one-directional triangular path between three mirrors (instead of the usual bounce-path arrangements using two mirrors), with the laser medium placed in one segment. Such a scheme may permit managing the laser-generated light so that the mini-pulses become predictable and even controllable.

# Archaeological Lab

The archaeological laboratory is at last emerging from the scientific middle ages. No longer do analyses of artifacts involve painstaking wet-chemical methods which can last for days and in the process destroy large chunks of the valuable objects. Now the passwords in museum laboratories are such physical tools as laser microprobe, electron beam microanalysis, and neutron activation analysis.

Application of the first two of these methods to archaeological uses has been pioneered at the Boston Museum of Fine Arts by William J. Young, Head of the Museum's Research Laboratory, and Robert E. Ogilvie, Sc.D.'55, Professor of Metallurgy at M.I.T. (see *Technology Review*, Dec., 1967, p 21). The potential of the third technique—neutron activation analysis—for archaeologists was described at the American Chemical Society's 156th national meeting in Atlantic City this fall.

Neutron activation normally requires a nuclear reactor to produce a beam of neutrons to shine on the object under study. The spectrum of radiation resulting from the attack by the neutron beam then makes possible identifying the constituents of the object. Obviously not every archaeologist has a convenient nuclear reactor handy. To overcome this lack, Professor Adon A. Gordus of the University of Michigan has developed a small source of neutrons composed of plutonium mixed with beryllium, producing a neutron beam sufficient for accurate analysis of small objects.

Dr. Gordus reported to the chemists that he has used his neutron source to analyze more than 1400 ancient and medieval coins, including many from the Persian Sassanian period (222 to 651 A.D.). Studying principally the silver content of these coins, Dr. Gordus has discovered political analogs and also has found evidence of many counterfeits, both ancient and modern. Dr. Gordus noted that the amount of silver in the ancient coinage was occasionally manipulated by government; a decreasing silver content, he said, often reflects a period of unrest and instability. Ancient forgeries contain far less than the regular amount of silver, the modern ones a higher ratio of gold to silver, since refinement skills have improved in recent times.

Dr. Gordus' technique, with which he can analyze even small slivers of material without destruction, is also useful for tracing the glassy mineral obsidian. Obsidian samples from different sources have different characteristic compositions, and the analyst has merely to match the analysis of a piece of obsidian against the records of the few North American sources in order to pinpoint the origin of any piece. This rare mineral was used by American Indians for decoration, and by investigating its original sources archaeologists can plot American trade routes of 2000 years ago. In one case reported to the American Chemical Society, University of Michigan workers traced obsidian used 2000 years ago by the Hopewell Indians in Ohio, Illinois and Michigan to a source in what is now Yellowstone National Park.—*Peter Gwynne*

## Lunar Soils

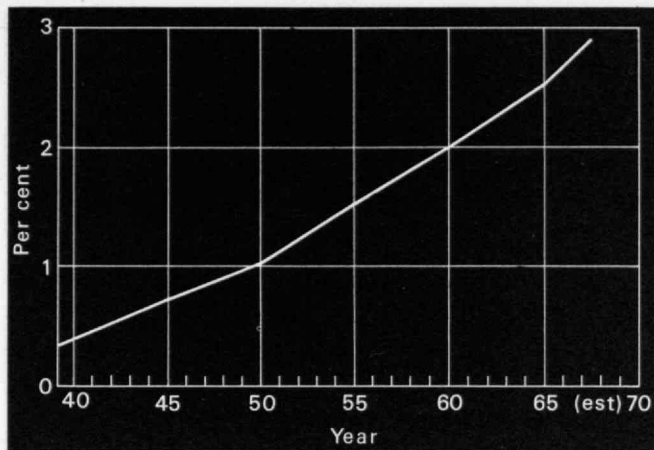
The "experts" hold a good many different views of what the moon's surface may be like. And their tendency to "homogenize" the moon probably means that everyone is "correct to a degree concerning the properties of the lunar surface." But the real answers are still to come, and present methods are at best a frustration to engineers trying to predict the moon's "soil" mechanics.

A new report from the Soil Mechanics Division of the M.I.T. Department of Civil Engineering, proposing additional research on lunar soils and surface conditions, emphasizes that the surface of the moon is probably as complex and varied, in its way, as that of the earth. Although surface moisture is apparently lacking in the moon, says the report, the surface features almost surely include the lava flows, deep layers of dust, and coarse granular material of all sizes predicted in many studies. But no one of these soil types is exclusive; at least for the present, none can be assigned to certain areas and all must be expected anywhere.

"Remote prediction of surface properties is still in the development stage," says the M.I.T. report, "and no prediction of engineering behavior can be made at this time without tactile measurements"—even on earth, let alone on the moon. But lunar surface research has suffered from some more controllable deficiencies, as well: many investigators, according to the M.I.T. review, have "begun with a preconceived idea of what the lunar surface is like (on the 'average'), and then they find some evidence which supports their hypothesis." The alternative is an engineering point of view—"one that is not trying to prove a theory concerning the origin and formation of the moon but is attempting to solve engineering problems and increase the safety of men and equipment on the lunar surface," according to the Soil Mechanics Division.

The M.I.T. report is the work of W. David Carrier, 3d, '65, and David J. D'Appolonia, Research Assistants; R. Torrence Martin, Research Associate; and Leslie G. Bromwell, '61, Assistant Professor of Civil Engineering; all worked under the supervision of T. William Lambe, Sc.D.'48, Head of the Soil Mechanics Division.





Since 1940 electronics manufacturing—for consumer, government, and industrial markets—has grown from a negligible to a very modest part of the gross national product. By the year 2000, however, consumer electronics alone will probably be second in importance to the automobile among the U.S. consumer durable goods industries. D. Reid Weedon, Jr., '41, Senior Vice President of Arthur D. Little, Inc., told the Electronic Industries Association.

## The Growth Industry

D. Reid Weedon, Jr., '41, Senior Vice President of Arthur D. Little, Inc., brought his crystal ball to the Board of Directors of the Electronic Industries Association: the "cumulative nature of technology," he said, makes the prediction of new products and technology a "fascinating exercise," and he proceeded with some demonstrations: by the year 2000 there will be "an order-of-magnitude increase" in our dependence on electronic systems, and an "incomprehensible number of on-line-type system requirements." Companies will be manufacturing total functional systems instead of isolated product packages, and consumer demand will result in "a level of reliability which is unknown today."

Among Mr. Weedon's more specific predictions: new extensions of electro-optics technology involving laser systems, real-time computer-interactive visual displays, optical data-processing, and holography, possibly leading to "some form of 'true' three-dimensional television" by the year 2000; the possibility of economical, high performance electric cars as a result of advanced battery, motor, and controls technology; a "revolution in production economics" through the combination of computer-aided design, large-scale integration, and numerical control; and comprehensive family electronic communications centers in the home, including two-way video channels, facsimile, and remote access to various computer services, all made possible by vastly expanded wide-band-width digital communications networks. In addition to conventional cable and microwave, such communications will be facilitated by communications satellites and probably laser pipelines. All these developments will raise consumer electronics to a position second only to the automobile among the nation's consumer durable goods industries.

Because of the increasing demand for electricity, and concern over the discharge of increasing quantities of heat to waterways from steam-electric power plant cooling waters, Mr. Weedon said exotic means to supply electric power may have to be considered. One possibility, although now remote, would be to collect and transmit "free" solar energy using very large areas of photovoltaic converters in space, whose power output could be transmitted to ground stations by laser or mi-

crowave beams. "Estimates show," he said, "that a few very large satellites (20 to 30 miles in diameter) would supply the entire electrical power needs of the United States." The hitch: development of extremely-high-efficiency photovoltaic converters.

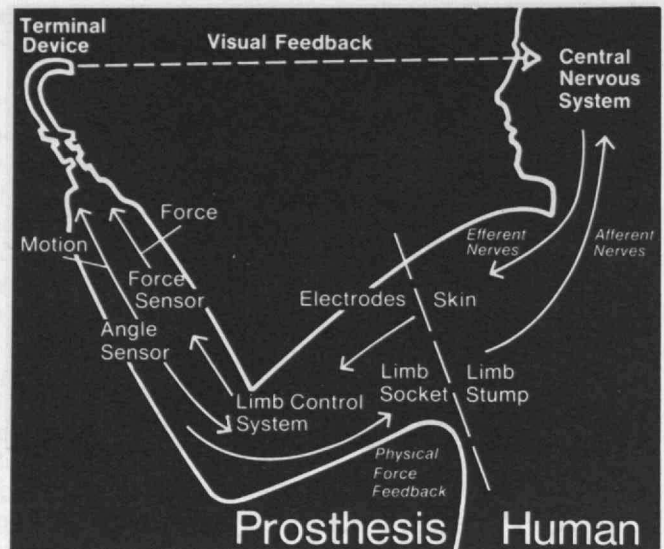
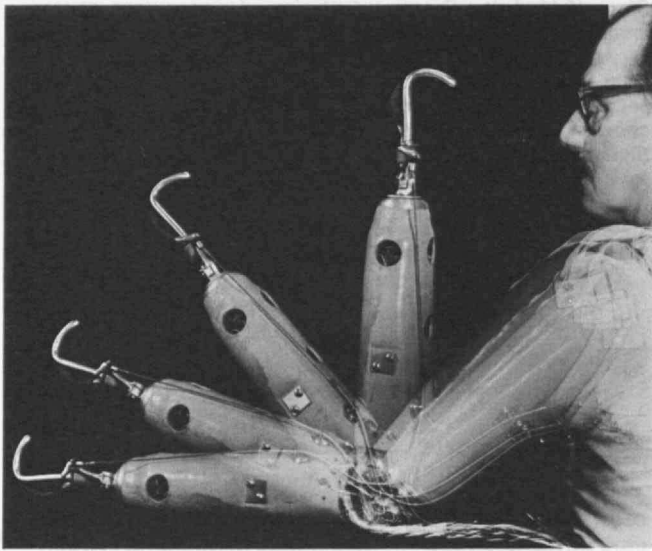
## Biological Transistor

Proteins, nucleic acids, and other constituents imbedded in the walls of nerve cells apparently can operate as electrical converters to produce spikelike signals characteristic of neural impulses.

Victor E. Shashoua, Research Associate in Biology at M.I.T., believes the findings suggest a biological analogy for the modern electronic transistor. And he suggests that if electrically active materials in cell walls are in fact responsible for the generation of nerve signals, "it is possible to speculate that drugs might one day be developed that could influence the malfunction in nerves."

At the fall meeting of the American Chemical Society in Atlantic City, Dr. Shashoua described controlled laboratory experiments in which certain molecules found in nerve cells demonstrated the ability to convert direct current into pulses of alternating current which exhibit wave forms characteristic of spikelike neural impulses. The conversion apparently occurs at a junction between the acids and bases that make up the material under test.

This seems to be much like the conversion achieved when current flows across a junction in semiconductor materials; but in biological materials the current-conducting species are ions rather than electrons. Thus, says Dr. Shashoua, the phenomenon seems to be "a biological analog for the transistor."



## Boston Arm

Using the brain as "the best computer we have available" and the electric signals the brain transmits to muscle tissue in the stump of an amputee's arm, M.I.T., Harvard Medical School, and Massachusetts General Hospital, Boston, have produced the world's most advanced artificial limb—the Boston arm.

The new device is an excellent example of "symbiosis of a machine with a living system," explained Robert W. Mann, '50, Professor of Mechanical Engineering at M.I.T., at a press presentation of the four-year project last month in Boston. And, as though that aspect of the achievement were not enough, the device may offer hope to some of the 7,000 thalidomide cripples in this country and the 1,500 people here who every year add their number to the uncounted thousands of arm amputees.

The Boston Arm depends for operation on a completely healthy nerve system from brain to shoulder; thus it will rise when most amputees "will" it to rise, and it will lower in response to a corresponding nerve signal. The nervous system and the mechanical response are linked via contact electrodes held against the skin which pick up electric signals generated by the flexing of bicep and tricep muscles. Even when the signals are as small as .001 volts, or when muscles which have not been exercised for years are slightly activated, the mechanism will respond. One amputee at Massachusetts General Hospital learned to use his electronic prosthesis in 15 minutes, even though he had not tried using the remaining portion of his arm muscles in 26 years.

The chief advance of this volitionally controlled arm over previous artificial prostheses, especially the Bottomly Hand and the Russian Arm refined during the early sixties, is the introduction of miniaturized, standard electronic components, basic in space research and other fields, for medical purposes. Unlike the British and the Russian limbs, the Boston Arm is light,

weighing two pounds and one ounce, and operates from a lightweight battery worn around the waist, weighing a maximum of nine pounds. Most amputees, explained Dr. Melvin J. Glimcher, '57, Chief of Orthopedic Surgery at Massachusetts General Hospital and of the Harvard Medical School, do not like to use the mechanical arms presently available because of their weight and over-all inefficiency of operation. Therefore, he said, there would be a good market for a lighter, more efficient, more "natural" device.

The Boston Arm is the fruit of two other breakthroughs in artificial prosthesis design. First is the construction of a limb which will perform work continuously in proportion to the force exerted. Unlike the Russian and Bottomly prostheses, where the electrical signal in the flexing muscle triggers an automatic mechanical movement, the new arm moves slower, or faster, depending on how much force the muscle indicates, like the accelerator in a car.

Second, the arm uses a unique proprioceptive feedback concept developed by a graduate student in the Department of Mechanical Engineering, Ronald D. Rothchild, '63. Using negative feedback to the limb control, and a strain gage device, the arm can measure the amount of resistance it experiences to the pressure of gravity as it rises, or when it tries to lift a load. (The arm can lift up to 25 pounds.) Thus, while the operator cannot "feel" where his arm is, except through visual feedback, he does have a feeling for how much effective force the device is exerting. In this way the arm replicates at least one reaction characteristic of all normal bodily functions.

Liberty Mutual Insurance Company, the fourth partner in bringing the project this far, has devoted to date approximately \$160,000 and four years to the Boston Arm. And research will continue—particularly in the M.I.T. Mechanical Engineering Department toward refining the present arm-control system and investigating more natural feedback paths which could lead to the development of better artificial prostheses for the future.



# Seismology and Drift

Present-day theories about continental drift and sea-floor spreading are supported by all evidence that seismologists can accumulate. For example, comprehensive research involving the locations and directions of slip motions in earthquakes in very restricted belts around the earth, presented at M.I.T. this fall by Professor Jack Oliver of the Lamont Geological Observatory at Columbia University, adds important continental drift confirmation.

Professor Oliver used several slides to demonstrate that each separate experiment undertaken by him and his associates supported the drift thesis—the movement of large continental blocks caused presumably by the heavier crust overlying a less dense, weak substratum. Earlier supportive evidence has been advanced on the basis of (a) matching continental borders, (b) matching geological structures on opposite sides of ocean basins, (c) paleontological evidence, and (d) the singular program of evolution of living species prior to the separation of the continental blocks.

"Seismicity studies made between 1961 and 1967 provided us with the best data," Professor Oliver said. "Earthquakes are located down the slip planes where the crustal blocks plunge below the surface, as in the great trenches and island area of the western Pacific. Divergence occurs in the reverse situation—where the new crust is being formed at the loci of the oceanic ridges. Motion of the crust occurs at the rate of about two centimeters a year. At that rate, creation of the oceanic basins as they are today would require some 2000 million years."

Dr. Oliver noted as well that seismological studies of shear wave propagation helped sustain the drift hypothesis. "Across large, stable blocks of continent, propagation was good, but across down-sinking or up-welling zones the attenuation of the shear waves was much greater."

## Briefly Noted

### Space-Age Fallout: The Fuel Cell, etc.

The U.S. space program, less than one-half of 1 per cent of the U.S. gross national product, will go down as "a bargain," even though most of its valuable fallout "cannot be measured, weighed, or packaged," said William B. Bergen, '37, President of the Space Division of North American Rockwell Corporation, in Boston this fall. Among the possibilities, he was especially optimistic about the fuel cell, which he said may be the basis for "an 'on-the-spot' gas-fueled source of electrical engineering for homes, apartments, and businesses." It would be the basis, he said, for a power plant that would be "economically competitive, silent, and smokeless," and its technical feasibility "already has been demonstrated."

### Travel and the Ghetto

David P. Taylor, Associate Professor of Industrial Relations in M.I.T.'s Sloan School of Management, documents his statement in Cornell University's *Industrial and Labor Relations News* that Negro core-city residents travel farther than whites to reach their jobs: in one city, for example, white janitors travel a mean distance of 50 blocks to work; nonwhite janitors go 80 blocks.

### Testing Trains

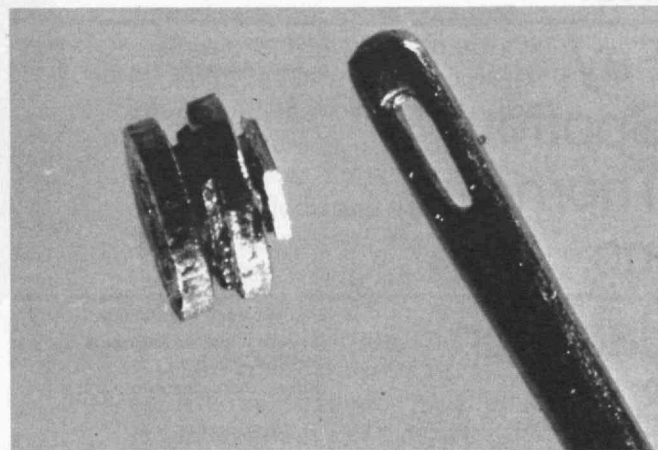
The high-speed trains soon to be tested in the Northeast Corridor are a feeble and "dangerous" effort to evaluate the future potential of surface travel, Charles L. Miller, '51, Head of the M.I.T. Civil Engineering Department, told a Senate commerce subcommittee this summer. The program should be larger, longer, and bolder; "it can lead to disappointment and frustration if the available resources are not adequate to insure continuous progress and results," he said.

### A Correction

Through an error in the original technical publication, the name of William B. Smith, S.M.'55, of the M.I.T. Lincoln Laboratory, was omitted from the list of those contributing to the research on anomalies in the size of the planet Venus, reported in these columns in the October/November issue, page 65. The *Review* regrets the omission and is happy to set the record straight.

### Solid-State Microwave Power

Higher levels of microwave power than ever before achieved from solid-state sources are promised by the successful operation of two series-connected Gunn-effect diodes at the General Electric Research and Development Center. Previous efforts have failed because the series connection of two diodes requires the very special conditions finally achieved by three G.E. physicists, SePuan Yu, Paul J. Shaver, and Wirojana Tantraporn; Dr. Shaver holds master's and doctor's degrees from M.I.T.'s Department of Electrical Engineering.



Two Gunn-effect diodes, connected in a series circuit nearly as small as the eye of a needle, can produce higher levels of microwave power than any previously known solid-state device. The tiny circuit demonstrated at the General Electric Research and Development Center measures 0.04 by 0.065 inch.

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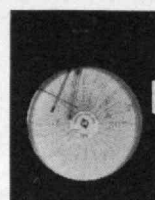
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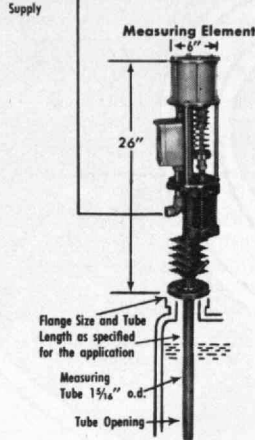
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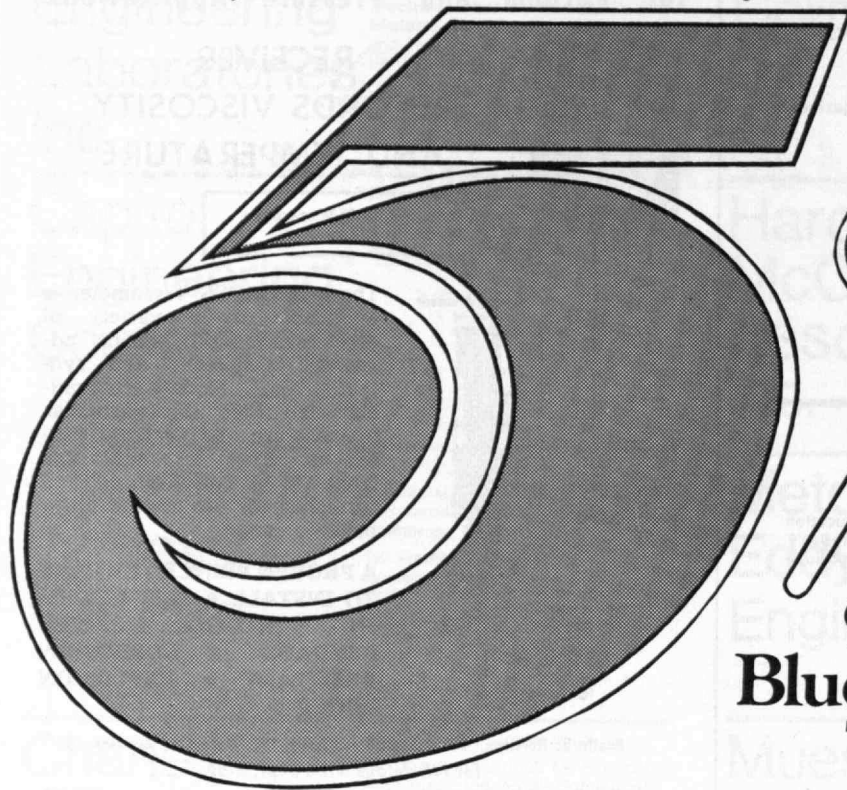
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## Concentrated Study

An M.I.T. experiment in "concentrated study" which may have a nationwide impact on teaching methods was reported by Professor John G. King, '50, to this year's second colloquium of M.I.T.'s Education Research Center this fall.

Dr. King, Professor of Physics, reported on an experimental presentation of 8.03T (S), Physics III, a course on wave vibrations and resonances which he gave during last June for 20 students.

"Every morning from 9 to 10:30 during the first two weeks, we worked in the lab," Dr. King said. "For the second two weeks we worked on projects, mostly in the field of resonance. At 10:30 we sat around a long table and, as a general thing, I lectured. I told them what I knew offhand about the topics of 8.03T rather than delivering prepared lectures—in an attempt to counter the usual cramming of facts and techniques. Between times, we watched movies, visited off-campus laboratories, and I conducted interviews—a kind of free-association relationship with pairs of students.

*"Freedom" and "variety" were the words most often chosen by students to describe their experience studying the entire first-term college physics course in four weeks of last summer under John G. King, '50, Professor of Physics. M.I.T.'s Education Research Center thinks the experiment was so successful that it may have significance for college physics teaching throughout the U.S. (Photo: Donald L. Estes, Jr., '71)*

"I am not prepared to say how successful we were; I know that I enjoyed it very much and I am quite confident the students did. What counts with time spent with people is quality of the time, not the quantity. I didn't know the students as well as I wish I had even in this



concentrated milieu, but I got to know them better than I would have in the standard classroom setting."

The entire experiment was monitored by the Director of the Education Research Center, Malcolm R. Parlett, a psychologist who has been making in-depth studies of interrelationships between student and professor at M.I.T. "It is difficult to distinguish between the effects of concentrated study and John King—probably impossible," Dr. Parlett said—referring to Professor King's engaging personality. "This was a 'syllabus-free' group," Dr. Parlett said, "whose enthusiasm was reflected in the fact that there was only 4 per cent absenteeism, and the nonattendance was usually for a good reason. Students turned in more homework than most students do for standard-type classes, and 16 of 20 did outside reading. Each enjoyed a rich experience. 'Freedom and variety' was a typical quote from students' reactions."

Dr. Parlett said that several students felt that future efforts in concentrated study should be extended to five, rather than four, weeks; only two said they felt the concentration was too heavy; very few said they were overworked. He was less sure that the virtues of the concentrated-study experiment were "exportable." This factor depended heavily upon "a teacher with a profound knowledge of his subject who enjoys contact with students, is not overawed by innovative methods, and possesses large measures of self-confidence and stamina," he said.

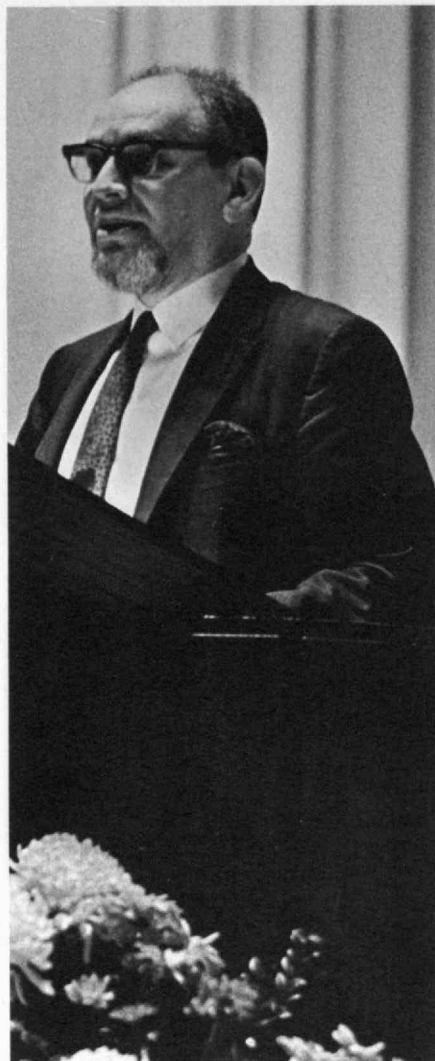
Dr. Parlett said the students—eight majors in physics and 12 in other fields—were representative of the M.I.T. population, and noted that one reason for what he called their "nontypical" student interaction was that most of them lived together in one place—Random Hall.

## "You Ain't Seen Nothin' Yet!"

Because it has made itself indispensable in modern life, the university is now one of the most important agents of social change. Yet his position on the advancing frontier of man's knowledge alienates the academic man from his constituency. Indeed, but for its responsibilities as a teaching institution, the modern university might itself become victim to "the illiteracy generated by our own progress," Walter A. Rosenblith, Chairman of the M.I.T. Faculty, told 260 former Sloan Fellows at M.I.T. this fall.

Yesterday's mathematics is today's management; yesterday's physics today's chemistry. So, the university quite naturally provides "a wonderful integration of new intellectual pursuits," an exhilarating and useful mood, "unique among human institutions," Professor Rosenblith said. "And when you talk of the frontiers of the contemporary university," he told the Sloan Fellows, "you ain't seen nothin' yet!"

But there lies the dilemma, he added. "By its very progress," said Professor Rosenblith, "the university is in a sense increasing the gap between itself and those who do not understand it." And this gap ("an antirational, know-nothing, power gap") is "a dangerous force which alienates the university from a large group in our society." Thus, said Professor Rosenblith, the university today has a special obligation "to look towards those who feel powerless and victimized as a result of its activities."



*By its very penetration into new fields of knowledge and human endeavor, the modern university increases "the gap between itself and those who do not understand it," Walter A. Rosenblith, Chairman of the M.I.T. Faculty, told former members of M.I.T.'s Sloan Fellowship Program this fall. And this fact, he said, gives the modern university a special obligation toward those "who feel powerless and victimized as a result of its activities." (Photo: Bradford F. Herzog)*



# A Housing Crisis of Our Very Own

University encroachment upon local industrial and residential property is a central component of town and gown friction. Cambridge, with two vast universities, has its own debate, questions, and counter questions on the role of the universities in local real estate.

The issue erupted at the end of the summer when the Cambridge Economic Opportunity Committee, the O.E.O.-funded anti-poverty organization, reported on a survey of housing and rent conditions for the city's 13,000 elderly. Roughly half, they found, have incomes between \$500 and \$1,999. And, said C.E.O.C.'s survey, more than half of these pay at least 50 per cent of their annual income for rent. Of the 2,061 elderly who replied, only 7 per cent earn over \$3,000 yearly.

Yet Harvard and M.I.T. together put approximately 13,000 graduate students onto the Greater Boston housing market each year; both by tradition and preference, many indeed prefer to live in Cambridge. If three graduate students live together they probably have a joint income close to \$7,500, and there are apparently plenty of landlords who are making that calculation.

## Town Meeting Outrage

When more than 800 Cambridge residents appeared at a September "town meeting" held by C.E.O.C., one woman said her rent had spiraled upward from \$60 to \$125 per month in the course of the last year. Another testified that hers had risen from \$60 to \$120. Outrage and anger were the order of the day.

The C.E.O.C. meeting ended by passing a lengthy platform of resolutions, some of which upbraided the universities as a major cause of rent rise and poor living conditions. Among the requests: that both Harvard and M.I.T. "make public their plans for development of their facilities," that further "buying of property by Harvard, M.I.T., N.A.S.A., and speculators be stopped," and that the universities "open their own projects,"—Westgate, Peabody Terrace, *et. al.*—to nonuniversity elderly and families.

## And Some Replies

The response from academic institutions varied. Howard W. Johnson, President of M.I.T., wrote to Mayor Walter Sullivan, in connection with a City Council hearing on housing: "There is, in my judgment, no issue of more pressing concern to the citizens of Cambridge than that of housing." He said, "We are giving highest priority to building more accommodations for students on the M.I.T. campus." James R. Killian, Jr., '26, Chairman of the Corporation, assured the C.E.O.C. that plans were underway to help the Cambridge Corporation, a two-year-old Institute-begun group designed to help ease residential problems but whose impact, it is generally agreed, has been disappointing.

However, in a prepared statement to C.E.O.C., Dr. Killian also said, "Let it not be forgotten that this housing shortage and the rent escalation hurts us too. We have many people of relatively low income, and some with only bare subsistence incomes, within our own M.I.T. community." He called for an all-out effort by the city government—with some M.I.T. help—to undertake construction to relieve Cambridge's housing shortage.

*The antiquated plant of Beckwith-Arden, Inc., in North Cambridge will yield to a moderate-income apartment development for which M.I.T. will provide pilot financing and management assistance. The Institute's purpose is to help increase the supply of housing in apartment-short Cambridge, to which the Cambridge Economic Opportunity Corporation has responded with "cautious optimism" because "many good-sounding housing schemes don't work out."*



Harvard made its own somewhat different response to the convention resolutions. While assuring the university's concern, Charles P. Whitlock, Assistant to President Nathan S. Pusey, noted that to let city residents live in Harvard housing would simply put more students onto the tight local housing market. He added that all Harvard properties were public knowledge already, and that Harvard does not use "straws" to acquire Cambridge land. Finally, an invitation to the City Council's hearing on the C.E.O.C. resolves was declined by the Fellows of the University due to Harvard rules. However, when the different parties met, Harvard was represented.

### **Housing for the Needy**

In the meantime M.I.T. announced it would provide risk financing and personnel for construction of 150 apartment units for non-M.I.T. residents in North Cambridge. Under the 221 D3 program, the Federal Housing Administration will pay some of the estimated \$3.5 million cost, and rents will be calculated on the basis of income. As in most 221 D3 federal housing, the apartments will be available and practical for people in the \$6,000 annual income range and higher; hence, the project will not reach the \$2,000 yearly income group which C.E.O.C. had championed, unless possible plans for making units available under the leased housing program materialize. Upon completion, the building will become a co-operative.

The C.E.O.C. convention appointed a co-ordinating committee to execute their demands and find ways of further action. The committee drew up four bombshells, among which were "that the Cambridge City Council require universities and other nonprofit institutions located in Cambridge to make public their plans for future growth." Another resolve required the city to give first preference to elderly housing on all city-owned land use allotments, and a third required the city to call a moratorium on the sale or transfer of its own land until a survey of total housing needs is completed. Finally, the co-ordinating committee recommended that the city council make "every means of using its legislative and taxing powers to aid the development of low-cost housing and curtail the escalation of rents in Cambridge."

### **And Needed Action**

After a packed hearing on the committee's resolves, the City Council approved all four and launched an investigative study of rent control. And, while neither university administration seemed gleeful over the developments, at month's end both were working diligently on this cousin of the much-studied "urban crisis" which had mushroomed in their common back yard.

Charlotte Cherrington, a C.E.O.C. worker who has handled the federal-state leased housing program—which offers rent subsidies for persons of low income—commented that many Cambridge residents looked with favor on the M.I.T. construction proposal. "Cautious optimism" she said described their mood. "But," she said, "they know from experience that many good-sounding housing schemes don't work out. But so long as the rents are suitable to the people who need a place, at \$95 per month, say, the M.I.T. project is welcome."



# The Laboratory That Isn't

Though its Director insists that it is more a "state of mind" than an organization, M.I.T.'s Urban Systems Laboratory has suddenly assumed most of the characteristics of the "real thing"—a headquarters, a computer, a staff, and a thirst for money.

Through the Urban Systems Laboratory, M.I.T. will try to provide a focus for students, faculty, and resources in the service of urban problems, Charles L. Miller, '51, Head of the Department of Civil Engineering and Director of U.S.L., told a seminar this fall. In this sense, he said, U.S.L. is simply "that community of people who are interested in urban problems." It is open to all, and there are six Associate Directors, in as many M.I.T. departments, to help stimulate interest on the part of faculty and students alike.

But it was clear from the beginning, six months ago, that among faculty and students the "common denominator" of interest was the systems approach—the effort to bring many tools to bear on complex problems, according to Professor Miller. Hence the name, and hence, too, the emphasis on computer-aided urban research which has led the U.S.L. to acquire a time-shared 360/67 I.B.M. computer in M.I.T.'s new Information Processing Services Center. The system, including terminals located throughout the campus, was installed in two months last summer by Mary E. Schumacker, '60, and is now operated under the direction of Jay R. Walton, Associate Professor of Civil Engineering.

"Seed money" for U.S.L. activities has come from M.I.T.'s \$3 million Ford Foundation urban studies grant (see *Technology Review*, Jan., 1968, p. 64). But Professor Miller calls these "fuse" funds because of the explosion of research proposals which they have generated. Already there have been three major summer studies—on matching technology to urban problems, urban information systems, and the management of solid wastes—and there is active co-operation with the Boston Model Cities Program and with the Cambridge Redevelopment Authority. But there is "disappointment and frustration," too, says Professor Miller. For despite the national concern for urban problems and six months of effort by M.I.T., funding to do anything "significant" in the area of urban studies is not yet available.

## Equal Opportunity: Improving the Odds

M.I.T. President Howard W. Johnson has appointed a special, 19-member task force, chaired by Jack P. Ruina, Vice President for Special Laboratories, to recommend targets for Institute hiring of persons in minority groups. A preliminary report is expected this month and a long-range one will be made early next year.

"The Institute must do more to increase its effectiveness" in providing "additional career employment opportunities to members of the black community and other individuals of disadvantaged background," he explained in announcing the appointments. Mr. Ruina said, "The task group is an indication of the administration's deep concern that real progress in hiring is accomplished."





Jack P. Ruina

The group will probably translate its recommendations into dates and numbers. Mr. Ruina said, "We want to reach people of any background who have somehow fallen by the wayside.

"But numbers and quotas are not our aim; we will examine M.I.T.'s policies and practices to make sure we have no barriers which have been created—however inadvertently—in past years."

On the whole, M.I.T.'s hiring practices compare favorably with national figures; while .7 per cent of industry's management personnel is Negro, M.I.T.'s rate is .9 per cent. Of M.I.T.'s total work force of some 4,000 employees, 2.8 per cent are Negro. However, M.I.T. falls behind still in the number of Negroes among its office personnel; M.I.T.'s rate is 3.2 per cent compared with industry's 4.4 per cent.

M.I.T.'s technicians are .9 per cent Negro, or one-third above the national industrial average. The Institute has two Negro professors.

### What Counts as Progress?

Another job of the task force will be to determine which figures to take as hiring goals in an effort to conform hiring practices to local population makeup. However, the question remains as to which population figures to use as guides. Cambridge is 7.7 per cent Negro, which makes M.I.T.'s 2.8 per cent Negro work force seem slight.

But compared with the whole state (Massachusetts is 2.2 per cent Negro), M.I.T. is doing well. The core city of Boston is 10 per cent Negro, but the Boston Metropolitan region is only 3 per cent. M.I.T., which stands somewhere on the geographic fringes of the problem-ridden core city, yet which also is high in local influence and prestige, will have quite a number of choices to make.

## To Invent the Future

A new call for the constructive involvement of M.I.T.—and of all academic institutions—in "factoring the dilemmas of today's world" came from Howard W. Johnson, President of the Institute, in his annual report to members of the M.I.T. Corporation this fall.

"We must open the way . . . to assign resources as well as attention to the larger problems of society that we have never adequately attacked before," wrote President Johnson.

Four dilemmas today "plague the nation's sense of well-being, our belief in ourselves, and our ability to cope with the new forms of crisis that will emerge in every year of every man's life," President Johnson said. "We know that there are times when the most basic problems . . . can only be solved by the application of large technical systems; while, on the other hand, we feel a deep yearning for . . . individual expression and for the person-sized contribution. On one hand, there is an obvious need for interdependence and close communication among people . . . yet there is a profound wish for independence and privacy."

There is also "a deep criticism that what has produced and continues to produce so well for so many people has produced so little for a sizable group in this country or for an even larger group in the world as a whole." Finally, there is "a gnawing doubt" that our large-scale, technically based economy could function equally well in peace as it does goaded by war.

To respond to these central problems, President Johnson called for:

1. A "new ethos of concern for one's fellow men," an education in which "learning with a purpose and a professional approach is accompanied by an abiding concern for the condition of man."
2. A new freedom for each M.I.T. student to formulate his plans, make full use of M.I.T.'s resources, and "write his own educational ticket."
3. A redetermination to make learning the outcome of experience. To achieve this goal, said President Johnson, will require "an attitude of adaptability and a continuing, persistent and pressing concern for student involvement in the affairs of M.I.T."
4. A new attack on interdisciplinary problems that "bridge across more than one field to deal with the human purpose."
5. A new emphasis on creativity and brilliance in the M.I.T. faculty. The core of M.I.T.'s quality, said President Johnson, is the faculty—"its continuity, its willingness to stay young, its reach to the future."
6. A "sense of urgency and priority" in providing new opportunities for disadvantaged members of society.

President Johnson cited two factors which threaten M.I.T.'s achievement of these goals. One is the reduced federal support for research. The cuts of 1967 and 1968 "now begin to affect our activities in a serious way," he said, "and it is my duty to warn of the dangers that will surely result if the country does not act promptly to reorder priorities." The second threat is Selective Service, which, as the law is now written, acts with "inequity, unpredictability, and inflexibility" to encourage "uneasiness and frustration among young people."

Yet despite many handicaps such as these, M.I.T. throughout its history has experienced a "continuous awakening." So it is not now unreasonable that society expects us to "proceed responsibly to invent the future," he declared.

## To Let the Student "Do His Thing"

In sharp contrast to most M.I.T. students who "are too busy studying to get an education," nearly all undergraduates in 6.711, the digital systems project laboratory, are syllabus-free, committed, and happy in their work. This much-sought-after pedagogic achievement was carefully documented this fall in an hour-long presentation by Malcolm R. Parlett of the M.I.T. Education Research Center, reporting on his in-depth, semester study of some 50 men recently enrolled in the course.

"A high proportion of students in 6.711 enjoy, and become deeply involved in, their work for the following excellent reasons," Dr. Parlett explained. "First, they are given an opportunity for professional-like endeavor; skills are relevant to future jobs; students identify with their subject; they acquire a new sense of competence. Second, projects are individualized, not standardized—a student 'does his thing.' Third, an absence of short-term deadlines permits a man to enjoy long periods of uninterrupted work. Finally, students work in teams of two, thus encouraging dialogue and co-operative effort."

Dr. Parlett, a psychologist, also reported the other side of the coin—



there are several less desirable features about the environment and instruction in 6.711. "Although a student knew what project he wanted to do and usually did it well, he could have done it better if his time were not so widely distributed across five or six courses. This reflected a common complaint on the campus—'M.I.T. keeps you too busy studying to get an education.'"

Although students work in teams, there is little interchange between teams. This reflects another campus-wide pedagogic constraint—students are educated in isolation. "There seems to be a conspiracy of silence," Dr. Parlett said. "Students don't dare open their mouths lest they admit ignorance."

There were also other problems: one of the two teaching assistants assumed a too authoritative stance only to discover that "you close out co-operation when you judge." Finally the course is graded, "and even many high-grade students are opposed to the arbitrariness of the grading system," said Dr. Parlett.

Dr. Parlett suggested that many good features of 6.711 pedagogy are exportable. He proposed the following:

1. Be sure that the subject is relevant to the real world.
2. Remember that people like to "do their thing."
3. Permit a wide exercise of choice, as 6.711 does.
4. Encourage dialogue and co-operation.
5. Keep the student's course-time schedule flexible.

## Briefly Noted

**Toward a "Public" Taxi:** A \$42,750 grant of the Department of Housing and Urban Development is being used by M.I.T. for a study for computer-aided transit routing. The idea, says H.U.D., is to use a computerized information center to route public vehicles to waiting customers in low-density urban areas.

**Crusader:** *Forbes* Magazine numbers John F. Banzhaf, 3d, '62, who studied electrical engineering at M.I.T., among the nation's "growing group of bright young men who are turning their talents to crusading." In Banzhaf's case, the crusade is on cigarettes: A year ago he convinced the Federal Communications Commission that cigarette advertising time on radio and television had to be matched with anti-smoking messages. Now he is developing a legal kit for lawyers who want to sue cigarette companies for health claims, and he is involved in a Federal Trade Commission action to ban all cigarette advertising from the air.

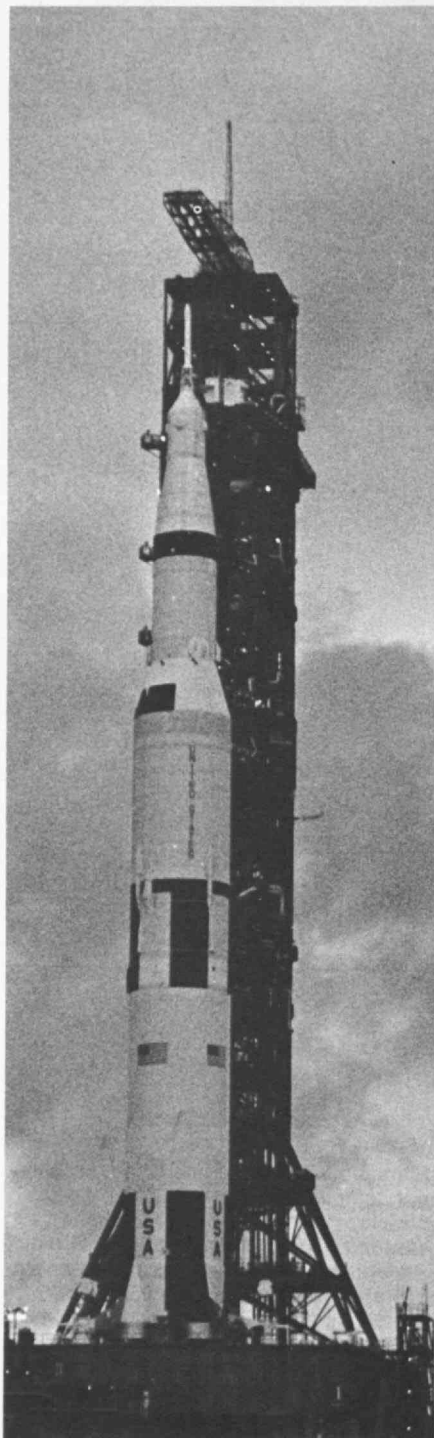
**A Co-operative "Charity"?** Most Boston-area fraternity houses pay municipal real estate taxes on the basis that they are social organizations. But the M.I.T. Student House is an exception. The courts have told the Boston Assessor that the "co-operative" house supported and represented by a group of its former residents is entitled to a "charity" exemption from Boston property taxes.

**Vocational Education:** A Ford Foundation grant of \$150,000 will be used by Education Development Center, successor to Educational Services Incorporated, to finance the first year of a vocational education project in co-operation with Harvard and M.I.T.



*Freedom has a very special magnetism—but do students really want it in the classroom? Yes, under some conditions, says M.I.T. psychologist Malcolm R. Parlett: they need dialogue and co-operative effort with colleagues, they need something "to get their teeth into," and they need to work without short-term deadlines. M.I.T.'s course 6.711, the digital systems project laboratory, qualifies in most respects; and students respond by "doing their thing."*

# Re-entering the Race to the Moon



The morning after the night before—that was the feeling we had as we drove across the six-mile-long causeway that connects Merritt Island, home of the Kennedy Space Center, with the Florida mainland. The mist had set in and nothing could be seen. After some initial confusion over our press credentials, the guards let us pass, and—still definitely in a fog—we headed for the News Center. It is here, in a former parachute factory, that the newsmen covering the various Cape Kennedy launches find their heaven. Amidst long tables of typewriters, clacking teletypes, multitudes of press releases (mostly useless), and helpful N.A.S.A. personnel, it was sometimes even possible to discover what was going on. It was also here that one found out where it was permissible to go unescorted: No where!

Between this time and the morning of the launch there was a well-paced schedule of press conferences, briefings, tours, and other less interesting occupations with which newsmen could amuse themselves until the time arrived for the real reason that they were all there.

## Worrying About the Wind

There is only one word to describe the attitude we found at Cape Kennedy during this period—optimism. Although Apollo 7 was the first manned flight in over 20 months, there seemed to be no doubt that a full recovery from the tragic fire of 18 months ago had been made and that the launch would be a complete success. Two days before the scheduled flight, Paul C. Donnelly, Launch Operations Manager at the Kennedy Space Center, told us that "I have never seen cleaner launch preparations."

Another note of optimism, and also one of caution, came from Rocco A. Petrone, M.E.'52, Director of Launch Operations. Commenting on the pre-launch progress, he too expressed extreme satisfaction with the smoothness with which things were going. At the same time, though, he talked about what seemed to be the only worry which existed concerning the launch—the wind.

Although not a problem directly related to the functioning of the spacecraft or launch vehicle, the rather high winds

which had been occurring during the two days immediately preceding the lift-off could have presented real problems if an on-the-pad abort had become necessary. The system utilized to remove the astronauts from danger actually lifts the entire Apollo spacecraft free from the Saturn launch vehicle and then releases it back to earth on three parachutes; so a careful analysis of the prevailing wind conditions was necessary before a go/no-go decision could be reached for the flight. Fortunately, wind conditions did not become so severe as to cause flight delays, and at 11:02:45 E.D.T. on Friday, October 11, we watched the United States re-enter the manned race for the moon.

## The Death of the Kennedy Center

The location from which most of the working press witnessed this fateful occurrence was about 18,000 feet from the launch site. Press Site 2 consists of a wide grassy area, which was pretty well covered with remote television units, surrounded by about 200 little open-air telephone booths; each of these chairless torture boxes had a telephone on which to make or receive calls and a four-inch ledge on which to write. It was from the booths that reporting was to be done. The rocket seemed to be standing almost directly in front of us, but when the firing actually occurred the rocket had already cleared the top of the gantry tower before the first sounds of ignition reached us. The sky was so clear that we could see staging with the naked eye and still follow the rocket up further.

Then it was over. Suddenly, the Kennedy Space Center seemed to die. With the exception of those who stayed for the post-launch briefing four hours later (an hour late), all had seen what they had come to see and then left.

## Self-sufficient Guidance

Part of the success of the Apollo 7 mission belongs to the Guidance, Navigation and Control System (G.N.C.S.), which was designed at the M.I.T. Instrumentation Laboratory.

That system makes use of three methods of spacecraft guidance to accurately control the Apollo mission. In addition to the standard inertial guidance system



utilized by most present-day rockets, the Apollo G.N.C.S. also provides for an integrated use of celestial and ground-linked navigation. Controlling the entire on-board mission operation is a miniature digital computer designed at M.I.T. and built by Raytheon. This computer, which weighs only 70 pounds, not only constantly monitors information on changes in the spacecraft's position (new positions were recalculated about one million times during the course of the Apollo 7 mission) but also is permanently pre-programmed to control navigational operations, firing of the spacecraft propulsion system, re-entry procedures, and other related functions.

An optical tracking unit is also included in the system to provide a means of re-aligning the inertial guidance unit after it has been shut off during a lunar flight to conserve electrical power. By sighting only two stars and feeding their position into the computer, astronauts are able to trigger the system to complete the entire realigning procedure by itself. It is this self-sufficiency that promises to be so significant in the upcoming Apollo flights.

There is always the possibility of a complete failure in communications between the spacecraft and controllers on earth. David G. Hoag, '46, Director of the M.I.T. Apollo Guidance and Navigation Program, responds to that suggestion by noting how full use will be made of all earth-based help. But, he says, "the spacecraft systems are designed to have the capability of completing the mission and returning without the use of earth-based tracking data."

#### A Busy Year at the Moon

Based upon the success of the Apollo 7 flight, Apollo 8, scheduled for December launch is now expected to be a lunar orbital mission—the dress rehearsal for a significant portion of the lunar-landing mission slated for the middle of next year. We were able to see the massive Saturn V booster, which will launch Apollo 8, moved from the Vehicle Assembly Building to launch pad. Its departure left the Vehicle Assembly Building looking rather empty, but there were enthusiastic preparations on other vehicles for further Apollo flights. In one bay, the three stages of the Saturn V which will carry the first Lunar Module into earth orbit awaited the Apollo 9 spacecraft assembly which is undergoing final testing. This will be an M.I.T. mission: Astronauts Russell L. Schweickart, '56, and David R. Scott, S.M.'62, will work with Command Pilot James McDivitt to practice the rendezvous and docking techniques necessary to a lunar landing, test the reliability of the Lunar Module subsystems and determine that the Apollo spacecraft should be qualified for a manned lunar flight.

The first stage of the Apollo 10 booster sat alone in another bay of the Vehicle Assembly Building; its second stage was under test elsewhere in the building. It is no small thrill to see the machine that will probably send the first American

astronauts upward to the lunar surface. Apollo 11 has not yet made an appearance in the Vehicle Assembly Building.

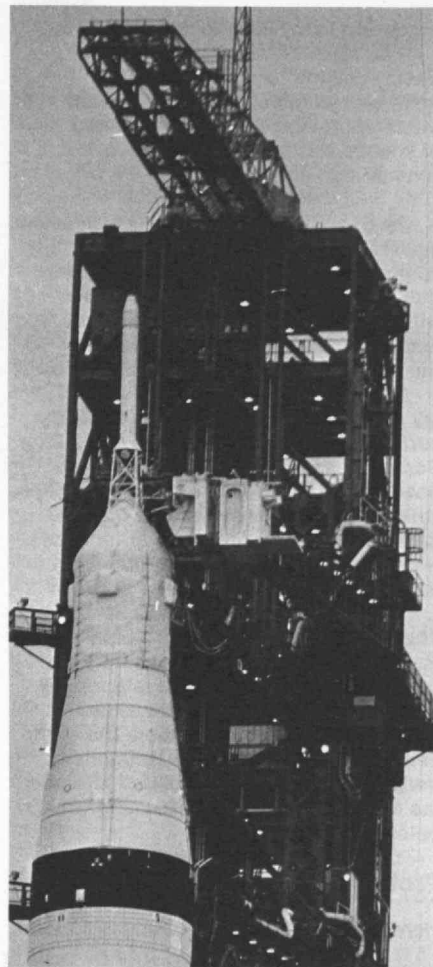
The American effort to land a man on the moon is highly dependent on the Apollo rendezvous and docking techniques. However, Wernher von Braun suggested, just prior to the Apollo 7 launching, that the lack of serious Russian interest in similar techniques may not indicate a lag in the Russian program. It may, instead, indicate that the Russians do not intend to use orbital rendezvous and docking in their first manned lunar landing.

The recent Zond 5 space mission, a free-return lunar flight, operated on a low-deceleration re-entry plan. A high-deceleration flight plan would have been chosen if the goal was solely to recover the instrumentation. "This was a dress rehearsal for a manned flight," Dr. von Braun told us. "They went through all this trouble in order to demonstrate to themselves that they can fly a re-entry flight path with deceleration below the limits cosmonauts could tolerate."

A new Russian booster, believed to have about 10 million pounds of thrust (1-1/3 times that of the Saturn V), is about to enter flight testing. This booster would allow the Russians to adopt a lunar landing profile similar to one originally considered by the United States.

They would softland an unmanned cargo vehicle on the lunar surface. If this is successful, a second spacecraft carrying several men would be sent to the same area of the moon, and the cosmonauts would return to earth using the supplies carried by the first vehicle. Such a mission profile would be typical of the "brute force" method characteristic of the Russian space program. If the new Russian booster is subjected to two unmanned flight tests prior to man-rating, Dr. von Braun suggests, the Russians could land a man on the moon by the summer of 1969. That will make next year a busy one for lunar traffic.

If Apollo 7 was large, it is overshadowed by the Saturn V which will launch Apollo 8 and 9. The M.I.T. students reporting on the Apollo 7 launch also witnessed the roll-out of Apollo 8 from Vehicle Assembly Building to launch pad (opposite and below), and in the nearly deserted Assembly Building they found units of Apollo 9, including (bottom) the first stage of the Saturn V. (Photos: George J. Flynn, '69)



George J. Flynn, '69, of Garden City, N.Y., is Editor and Neil J. Colvin, '70, of West Covina, Calif., is Managing Editor of Tech Engineering News, the M.I.T. student professional publication.

# Puzzle Corner

Allan J. Gottlieb, '67

A new era in my life has started. I now have a bunch of freshmen who thrice weekly call me "Mr. Gottlieb." I am really enjoying teaching calculus and would appreciate helpful suggestions any of you more experienced teachers could send along.

A whole month of school without pressure has really turned me into a cheerful person. So cheerful that I will make sure that at least one problem this month will be easy. My "vast" experience in teaching (one month) has taught me the advantages of instilling confidence.

My girl friend, a physics major, is currently taking an electronics lab. Somehow seeing a miniskirt and a red bow playing with a Tektronix oscilloscope strikes me as very funny. I feel that she is more suited for working over an oven (where all women belong, yeah!). Also, the results turn out better that way.

There will be no solutions printed this issue or next. We'll use this chance to catch up on the mountain of late replies to last year's problems which have accumulated over the summer. The February issue will contain solutions to the problems given in October/November, the March issue to the problems given below.

## Problems

Here's one from the Russell A. Nahigian ('57) Collection:

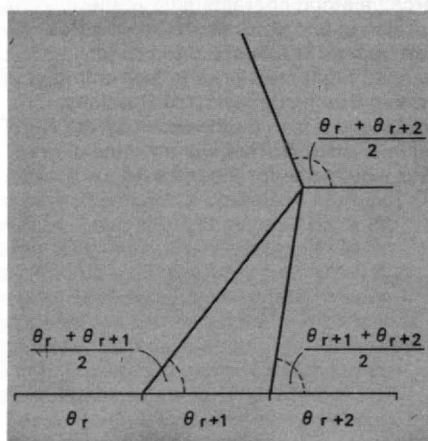
**6** A man dies leaving a will stating that one-half of his horses go to the eldest son, one-third to the next oldest, and one-ninth to the youngest. Alas, at the time of death the man has 17 horses. However, a shrewd lawyer solves the problem without killing any of the horses. How?

Donald R. Oestreich, '67, has a take-off on a chess problem from last year:

**7** Problem 31 (May, 1968) was quite easy, but it suggests a more interesting problem. Consider an infinite chessboard having one edge 8 squares long and all 32 pieces. What is the largest number which can be on the board and there still be no legal moves for either side?

This mathematical problem submitted by S. G. Ellis actually arose from honest scientific research. (See, Virginia, math is useful.) Mr. Ellis writes: "I have enjoyed reading your column in *Technology Review* and have wondered if you would be interested in a problem which none of my mathematical friends at RCA Laboratories has been able to solve. The problem arose during some speculations on the growth of crystalline films."

**8** Take rectangular co-ordinates  $0x, 0y$ , and divide the  $0x$  into equal segments of length  $d$ . With each segment associate an angle  $\theta$ , circularly random in the range  $0 \leq \theta \leq \pi$ . Where the segments meet, lines are erected at angles to  $0x$  which are the arithmetic mean of the  $\theta$ 's in the adjoining segments. As these lines meet, new lines are continued from the intersection according to the rule illustrated below.

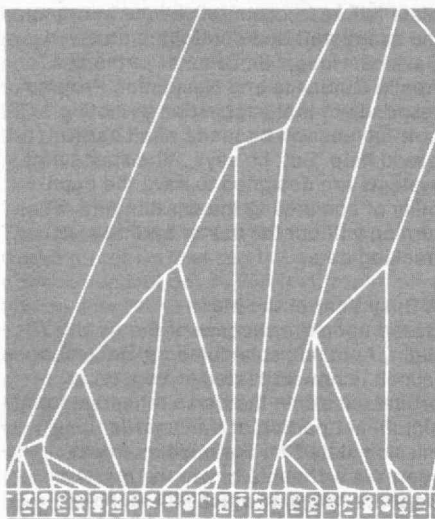


That is, each line makes an angle  $\alpha$  with the  $0x$  axis which is the arithmetic mean of the  $\theta$ 's of the segments between which it forms a common boundary. It is required to find an analytic expression  $\bar{X} = \bar{X}(y, d)$

for the average length of intercept,  $\bar{X}$ , of these lines on a horizontal line  $y = \text{constant}$ .

As a supplementary comment, Mr. Ellis writes: "Jules Levine [Ph.D.'63] of RCA Laboratories has obtained a solution for

'y' small by treating the problem as a "bi-molecular collision" where the colliding molecules stick together. At large 'y' the contributing segments no longer have a random distribution of angles; indeed, they cluster around 0 and  $\pi$ . This is illustrated in the drawing below which was worked out in our drafting department using a cyclical boundary condition."



John F. Claerbout, '60, has submitted a specific problem which he feels leads to an interesting field of study.

**9** Given the quadratic polynomial with matrix coefficients

$$P(Z) = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} + Z \begin{bmatrix} -3 & -1 \\ 14 & -11 \end{bmatrix} + Z^2 \begin{bmatrix} -4 & 4 \\ -58 & 28 \end{bmatrix}$$

Factor it. One solution is:

$$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} + Z \begin{bmatrix} 2 & -1 \\ 20 & -7 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} + Z \begin{bmatrix} -5 & 0 \\ -6 & -4 \end{bmatrix}$$

There are five other solutions.

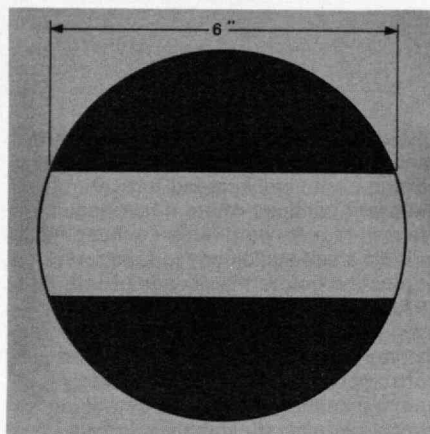
Jon writes as follows about this problem: "I worked up the theory and showed that for order  $p$  and degree  $n$  there will be  $(np)!/(p!)^n$  factorizations. One reason mathematicians may have avoided writing



this up is that it is hard to describe what happens in the case of degeneracies. Has anyone ever seen a write-up of this type of problem?

The following familiar problem and amazing solution is from James Barton, Head of the Mathematics Department at Pennsylvania State University.

**10** A cylindrical hole of length 6 inches is drilled through the center of an ivory ball. What is the volume of the ivory remaining after the hole is drilled?



## Speed Department

**SD3** Francis A. Packer, Jr., '51, wants you to find the number of diagonals that can be drawn in an  $n$ -sided polygon.

The last problem for this month comes from Russell L. Mallett, '57.

**SD4** How can you break a two-way tie using a coin which may be biased and still give both competitors an equal chance? In a three-way tie, how can you decide on first, second and third places in an unbiased manner?

## Better Late Than Never

The following solutions and correspondence pertain to problems numbered in the 1967-1968 series, in Volume 70 of the *Review*.

**5** Robert Scott comments and proposes a new problem which will appear later. And William T. Moody, '31, offers a solution in the form

$$V = (15 + 7/5) a^3/4.$$

**10** Solutions have come from Kenneth B. Blake, '13, Marshall Greenspan, '61, and Frank G. Smith, '11.

**15** A beautiful solution by Edward L. Cohen, S.M.'66, earns him a free subscription to *Tech Engineering News*. The problem:

The rationals in  $[0, 1]$  have measure zero because if we order them like  $(0, 1, 1/2, 1/3, 2/3, 1/4, 3/4, 1/5, 2/5, 3/5, \dots, 1/n, 2/n, \dots, (n-1)/n, 1/(n-1), \dots)$  we can cover them with open intervals of length  $e, (1/2)e, \dots, (1/2^n)e$ , so measure

of cover is  $\leq 2e$ . The problem is: Suppose  $e = 1/10$ ; then the covering has length  $\leq 1/5$ . Exhibit a real number in  $[0, 1]$  which is not covered.

Mr. Cohen writes that the problem has one solution,  $\sqrt{2}/2$ . His method: "0, 1, and  $1/2$  are no problem, for even with  $e = 1$ ,  $\sqrt{2}/2$  is not covered. For  $p/q$ , we take the interval cover of length  $e/2^q$ , which gives a larger cover than was sought. Therefore,  $1/3$  has the cover  $e/2^3$ ,  $2/3$  has the cover  $e/2^3$ ,  $1/4$  has the cover  $e/2^4$ , etc. The sum of the covers is equal to or less than

$$\sum_{n=3}^{\infty} (ne/2^n),$$

which converges (by the ratio test).

Returning to the problem, if  $\sqrt{2}/2$  occurs within these intervals, then

$$|p/q - \sqrt{2}/2| < 1/2^q \cdot 1/10 = 1/2^{(q+1)} \cdot 1/5$$

But  $1/2$  is irrational; so for each pair of integers  $p, q$  (with  $q = 1$ ),  $2p^2 - q^2 \neq 1$ . Hence

$$\begin{aligned} |p/q - \sqrt{2}/2| &= \frac{|(p/q)^2 - 1/2|}{(p/q) + \sqrt{2}/2} \\ &= \frac{|2p^2 - q^2|}{2pq + q^2\sqrt{2}} > 1/4q^2 \geq 1/2^{(q+1)} \cdot 1/5 \end{aligned}$$

The last fact can be proved by induction. Therefore, we have a contradiction and the problem is solved. We do not even assume that any of the rational points lie in the middle of their covering sets. Could the proposer be familiar with a relevant passage in Kamke's book *Das Lebesgue-Stieltjes Integral* for his inspiration?

George P. Wachtell, '43, gives an existence proof and a constructible sequence of which the desired point is the l.u.b. But alas this is not giving the point itself.

**19** A solution has come from Charles Volkstaff.

**20** A solution has come from Smith D. Turner, Jr., '26.

**21** The problem was this end-game double-dummy problem called the "Whitfield Six." Given:

♠ 7 3	♠ —	♠ 6 2
♥ —	♥ 6 3	♥ —
♦ K 10	♦ A 9	♦ 8
♣ 9 5	♣ 8 2	♣ 7 4 3
	♠ 5 4	
	♥ —	
	♦ Q	
	♣ J 10 6	

South to lead; hearts trump; North-South to make all the tricks against any defense.

David W. Ulrich, '52, writes: "I hate to keep picking on Peter J. Davis, Jr. (he gave the wrong answer to last year's problem 81, also a bridge problem), but his solution to problem 21 published in June, 1968, is incorrect. He has the right idea but the wrong timing. Here's how his solution breaks down: South ruffs spade in dummy and leads last trump. East discards ♦ 8, South discards ♦ Q and West discards ♣ 5. Now North-South can only make five tricks—two hearts, two clubs, and one diamond. Remember, after East discards ♦ 8, South *must* discard ♦ Q to save threat card in spades. This gives West a safe discard of ♣ 5. Now South cannot cash three club tricks as the ♣ 8 blocks the suit. Also there is now no hope for a squeeze.

"The correct solution is to cash the ♣ J or ♣ 10, discarding the ♣ 8 from North. Now trump a spade in North and lead the remaining trump. East's best discard is ♦ 8; South discards ♦ Q and West must discard ♣ 7. If West discards ♣ 9, North can cash ♦ A and finesse East for ♣ 7 (thus reason for discarding ♣ 8 on the first club trick). When West makes the ♠ 7 discard, North cashes ♦ A to squeeze East in spades and clubs.

"As for the comments regarding the missing ace, king, and queen of clubs, the 'Whitfield Six' is better constructed if the club suit is as follows:

♣ Q x	♣ J x	♣ 10 x x
	♣ A K 9	

But I still haven't solved the seven-spade problem!"

**25** A solution has come from David D. Terwilliger, '35.

**26** Solutions have come from Frank Rubin, '62, and Susan Prytherch.

**31** Solutions have come from Mark H. Yu, '70, and Mr. Volkstaff.

**33** Solutions have come from Messrs. Volkstaff and Yu.

**34** Solutions have come from Messrs. Turner and Yu.

Allan J. Gottlieb, '67, is a graduate student in mathematics at Brandeis University. Address correspondence to him at the Department of Mathematics, Brandeis University, Waltham, Mass., 02154.

# Correspondence Review



*Congratulations to  
Technology Review from  
Eucalyptus Tree Studio  
September, 1968*

## A Serious Piece of Work

To the Editor:

I am happy to inform you that your most recent manuscript ("New Directions for Management Information Systems," *Technology Review* for October/November, pp. 34 ff.) is the recipient of our "Golden Groan Award" for the most difficult projects assigned to the Eucalyptus Tree Studio. It was 10 days before I could come up with anything to show you at all; this one appears to me to be one of the most serious pieces of writing since the Magna Charta.

Dill Cole  
Baltimore, Md. 21218

## India—Toward Self-Sufficiency

To the Editor:

It may interest your readers to know that the war for calories which Samuel A. Goldblith so rightly calls for in his article on "The World Food Crisis" (*Technology Review* for June, pp. 20 ff.) is progressing with amazing success in the world's second most populous country, India. (It may also be progressing successfully in the most populous country, China. We cannot tell until the political turmoil in China ends, the country is allowed to return to work, and we get some reliable statistics.)

The problem of calories, as Professor Goldblith noted, is twofold: to get the food produced, and to have enough income to buy it. If food production increased rapidly while per capita income

outside of agriculture remained constant, peasants would eat well but food prices would fall so much that the effect on peasants' purchasing power would be catastrophic. India is doing well with respect to both food and income, and her success is an indication of what is possible elsewhere.

Between 1955-1956 and 1964-1965, India's foodgrain production rose from 69.2 million tons to 89.0 million tons, or 28.6 per cent. The population increased by only 23 per cent. Yet, because successful economic development was raising per capita income and rising income increased food consumption, foodgrain prices rose by 9 per cent relative to industrial prices even though the United States contributed surplus foodgrains to India.

In 1965 and 1966, India had very severe droughts. The country's total foodgrain production fell by almost 18 per cent in 1965-1966 and then recovered only partially. These droughts, not lack of technical progress in agriculture, caused the food crises of these years. Progress in agriculture continued and now that good weather has returned, production in 1967-1968 will be about 100 million tons (possibly more), an increase of more than 12 per cent above the 1964-1965 peak, while population has risen by less than 8 per cent. In tabular form, indexes for 1956, 1965, and 1968 are as follows:

	1955-6	1964-5	1967-8
Foodgrain production	100	129	145
Population	100	123	132
Per capita consumption of foodgrains	100	110	?

The increase in production has been due partly to many small improvements in production and partly to the development of new strains of rice which can respond to increased fertilizer use and increased irrigation. The Rockefeller Foundation, whose research workers developed the new strains, deserves a mighty vote of praise. But the increase has been due also to the response of Indian peasants. They are not lethargic; in the areas of the country so far reached by the new programs, one of their main criticisms of the Congress party in the 1966 elections was that it was not

getting tube wells, fertilizer, and the new seed to them fast enough. The technical advance will surely spread throughout India and continue where it has begun. We may look forward fairly confidently to India's self-sufficiency in foodgrain production before the decade of the 1970's is far along. We may do so even if in the meantime per capita income and therefore per capita food consumption in India rise moderately above present levels. And they will almost certainly do so unless India's development program is crippled by her shortage of foreign exchange and the United States curtailment of economic aid to counteract it.

India's success in raising per capita income is shared by most low-income countries. It is a common American belief today that through the world as a whole economic development is failing. This belief reflects the current American temper, not the facts. Cold and dispassionate statistics show that during the last decade, per capita income has been rising steadily and at a rather satisfactory rate in the great majority of low-income countries. The main exceptions are countries (like Indonesia, the Congo, and Communist China) where political turmoil has interfered. The major single barrier to a continuing rise now is shortage of foreign exchange with which to buy needed capital goods. If the industrial countries provide the economic aid necessary to buy those goods, a continuing rise may be predicted with some confidence. But in South America and the Near East, the war of food production is not yet progressing satisfactorily, nor are these countries increasing their production of other commodities for export, with which to buy food. And, over many areas of the world, the battle for protein sufficiency is hardly begun.

Everett E. Hagen  
Cambridge, Mass. 02139

*The author is Professor of Economics and of Political Science at M.I.T.*

## Can Black Meet White?

To the Editor:  
Having read R. C. Burrus' letter in the



# Techno- logical Crossword

May issue and M. E. Parker's enthusiastic endorsement of it in the July/August issue, I must take up pen to challenge. Mr. Burrus' offering comes with some superficial coloration of truth, but the meat underneath is still boloney, whether it be served up by a white segregationist or a black separatist.

I cannot claim to speak for the "ultra-liberals"—whoever they may be—but I suppose them to be outnumbered by just plain ordinary liberals among whom I should like to count myself. I aver that it is not, and has not been, the liberal claim that the black man should "one day become white."

The liberal view is that each person should be accepted on his individual merits, and that a society in which this is true will grow and bloom because of the diversity of the individuals who make it up. Perhaps we now recognize more clearly than before that the tint and timbre of American society as a whole must reflect more broadly and more consciously the contribution and presence of African culture and heritage, as it has that of European culture and heritage.

But Mr. Burrus will have none of this. To him black people are so different from white people that they cannot share the same "thought processes," let alone the same standards of morality and of beauty. I say (and so does science!) that morals are not racial; they are acquired.

As for standards of beauty, there are of course differences but they are not mutually exclusive; cannot a black person appear beautiful to a white, and a white person to a black?

Why, then, do many black militants today espouse black separatism? Why do black students at Northwestern University (and elsewhere) ask for exclusive dormitories? This seems to me perfectly understandable.

For years the white society has allowed the black little opportunity or respect, and what was offered came often rationed by tokenism, soured by reluctance, dripping with condescension, and sticky with the implied notion that the black should be "grateful" for having been

"given" something which others would consider their right as a matter of course. Today the black man is no longer afraid to speak his mind and give vent to his emotion openly, and many a one says: "To hell with you! If you don't want me, I don't want you!" What could be more human or natural than that?

For years, the threat and reality of physical violence hung over the Negro who dared "step out of line," whether by mere "uppityness" in the Deep South or by moving into a lower-middle-class white neighborhood in the enlightened North. Now there are blacks who talk openly of physical violence to achieve their ends. What does this show, except that, unfortunately, violence is still a part of universal human nature?

All these antagonisms are understandable indeed in human terms, but nevertheless I hope that they are not portents of our future direction; and it is up to the white majority to create a social climate in which that need not be.

Is it possible, then, to achieve a free and unified multi-racial society, where individuals can feel pride in their origins and their differences but also transcend these differences and relate to one another as individuals, in all the ways that the fine and loving facets of human nature allow?

It will certainly not be easy. One need but think of the past and present difficulties between English and French in Canada, Fleming and Walloon in Belgium, Hausa and Ibo in Nigeria, Hindu and Moslem in India, even Catholic and Protestant in Ireland. But these very examples show that the divisive differences between peoples are generally created in the mind and not by race. They are not inherent and not inevitable.

To overcome the divisiveness let's acknowledge first of all that prejudice is a common human failing and that we may still have a dose of it. Let's recognize our specific prejudices where we have them, and guard against formulating attitudes and rationalizations designed to help these prejudices rest comfortably. Let us rather make them uncomfortable, by refusing to let them affect our pro-

nouncements and actions. Let us, each one of us, make conscious and continuing efforts toward individual acceptance, understanding and respect, and toward an open and just social order.

It will be difficult, yes; but the alternative of a permanently divided America, in which, to quote Mr. Burrus, "white is white and black is black and never will the twain meld," can lead to nothing but strife and destruction.

Frank J. Heymann, S.M.'53  
Media, Pa.

## A Correction

### To the Editor:

A minor correction to the article commemorating the twentieth anniversary of the publication of the first edition of Norbert Wiener's *Cybernetics* (Technology Review for October/November) should be pointed out; my colleague in the work on the correlator system for brain potentials was Robert M. Brown, Jr. (Harvard, '49) rather than Robert R. Brown, Jr., E.E.'59.

John S. Barlow, M.D.  
Boston, Mass.

# Strobe Probe

Harold E. Edgerton, Sc.D.'31



## Give your employees a real break.

In little more time than it takes them to munch a Danish, drink a cup of coffee and chat around the coffee wagon, you can help them learn facts that may one day help save their lives.

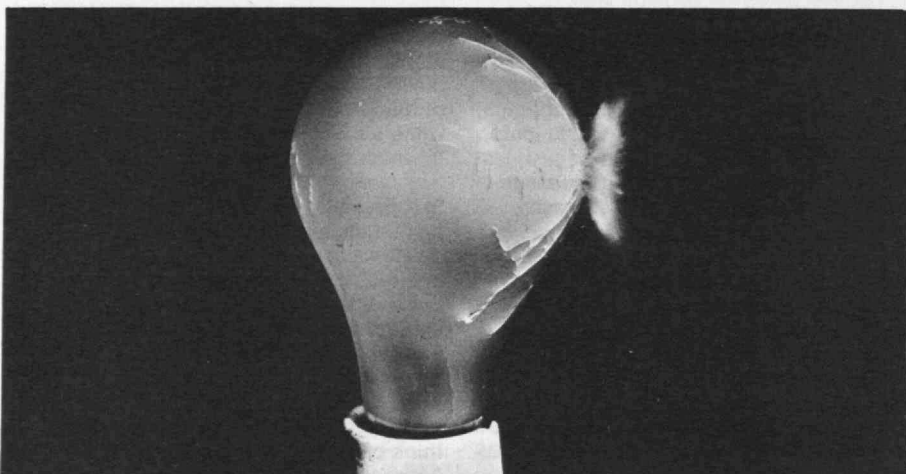
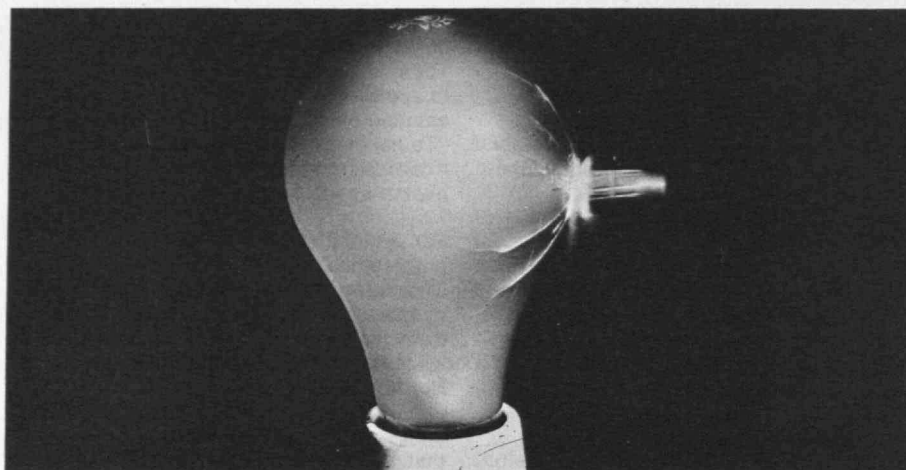
You can help them avoid being a statistic among the more than 100,000 workers who die from cancer each year.

We have a free education program of films, speakers, exhibits, pamphlets, posters, etc., at your service. It could very well help save the lives of some of your employees; maybe your own.

Call your Unit of the American Cancer Society and arrange a life-saving break for your employees.

**American Cancer Society** 

THIS SPACE CONTRIBUTED BY THE PUBLISHER



In the top picture, a 30-cal. bullet is partly into an electric light bulb. Note that the cracks in the glass are going faster than the bullet. They have a velocity of 5000 feet per second.

In the bottom picture, another 30-cal. bullet is inside a second light bulb. Question: Why is the second bulb cracked on the far side before the bullet arrives?

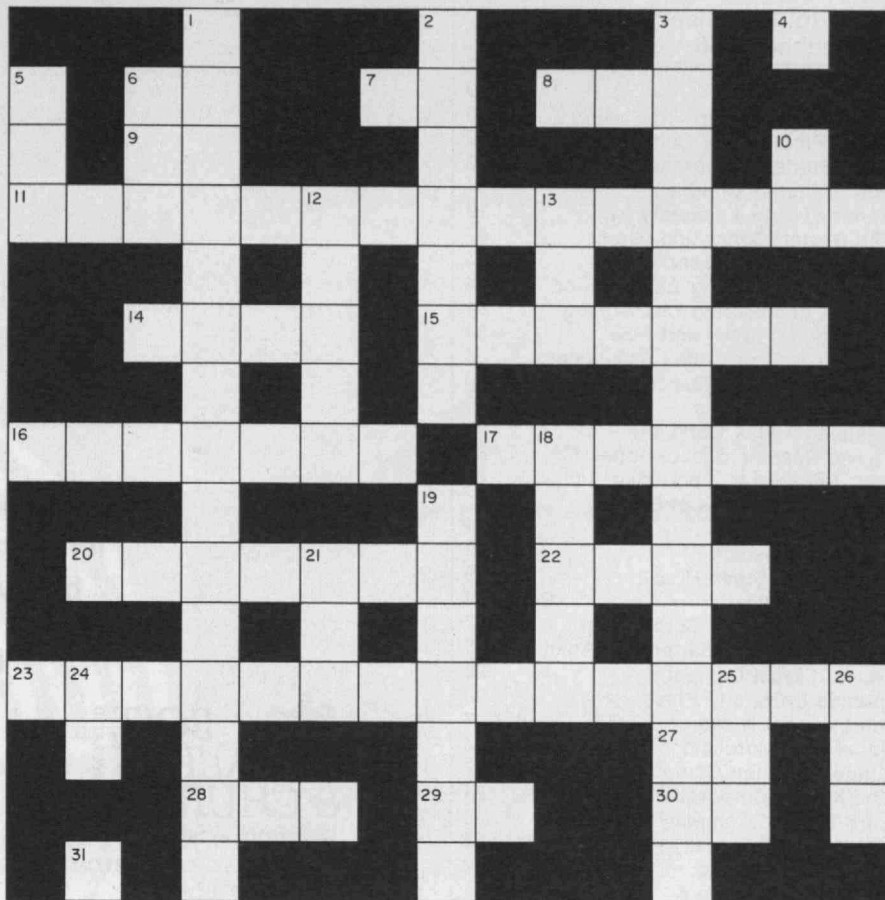
Answer is on p. 104.



# Techno-logical Crossword

Most of the clues to this crossword puzzle are in two parts, one part a definition of the word itself and the other an aid in constructing the word—i.e., by an anagram, hidden letters, puns, and so on.

For the correct solution bearing the earliest postmark, *Technology Review* will award a one-year subscription to the M.I.T. student magazine or newspaper of the recipient's choice; send solutions and comments to Mr. Sandor in care of the *Review*, Room E19-430, Massachusetts Institute of Technology, Cambridge, Mass., 02139. The correct solution will appear in *Technology Review* for January.



## Technological Double-Crostic

The correct solution to the puzzle on page 94 of *Technology Review* for October/November, 1968, is below. A copy of *Science and the Educated Man* by Julius A. Stratton, '23, has been given by the *Review* to Francis J. Safford, '34, of Peterborough, N.H., and Jared J. Wolf, S.M.'67, of Allston, Mass., for the first correct solutions (with identical early postmarks) to reach us. In all, more than 75 correct solutions came to David L. Holt, Sc.D.'65, the author. But no solver also discovered that the first letters of each definition make up the authors and title of N. F. Mott and H. Jones, *The Theory of the Properties of Metals and Alloys*.

Another copy of Dr. Stratton's book goes to Perry H. Ware, '35, who was the first reader to note the misspelling of "naphtha" (as "naptha") in the puzzle. Everyone who solved the double-crostic caught *Technology Review*'s second error—"85" in definition F should have been "35." (It is not the *Review*'s intention to add extra hazards in these mischievous ways.)

Mott and Jones, *Metals and Alloys*: ANY ATTEMPT TO DETERMINE THE THREE COMPONENTS OF THE VELOCITY OF AN ELECTRON AT A GIVEN INSTANT WOULD DISTURB IT AND MIGHT CAUSE IT TO JUMP FROM ONE QUANTIZED STATE TO ANOTHER.

Mr. Sandor, a graduate of the University of Cambridge, is studying for his doctorate in the M.I.T. Department of Metallurgy.

## Clues across:

6. Frequently used in interrogation! (2)
- 7,8. Like John in Scotland, pertains to a land-mass. (5)
9. Concerning D major. . .sing it! (2)
11. These changes must be made in mathematics and physics to get acceptable results. (15)
14. The young German detective brings back fruit as evidence. (4)
15. One of these hoisting machines may bring you a fortune overnight. . . (7)
16. A spectre lurks within the home of the elephant—ominous, to say the least! (7)
17. Personal belongings bring about results. . . (7)
20. This is being said by both the U.S. and the U.S.S.R.—but to each other! (4,3)
22. An Egyptian god who lives and lives! (4)
23. The study of natural symmetry. (15)
27. Behold! This sounds like a greeting. (2)
28. (See 10 Down.)
29. From Latin we have our bachelor's degree. (2)
30. A trademark of Columbia Records. (2)

## Clues down:

1. This type of philosophy, though confused, is in the open, calm, and equates perception with reality. (15)
2. One pace is sufficient to become mounted. (7)
3. I small, fine, tiny! I so far subdivided that I invisibly small! (15)
- 4,31. These two letters constitute an afterthought! (1,1)
5. That which needs no help from science and technology. . . (3)
6. These times are upsetting. (3)
- 10,28. The Cold War has been like this for years! (2,3)
12. Shakespeare apparently preferred this size of page. (5)
13. In our fair surroundings we are slowly being poisoned by this. (3)
18. Highland or otherwise, it does you good every now and then. (5)
19. This girl has a right to belong to the stars. (7)
21. Don't keep all of these in the same basket! (3)
24. Formula for recipe? Little used now—but seen everywhere! (2)
25. Bottle tops. . . ? It's all the rage, man! (3)
26. This beast is all right going backwards, and loses nothing that it carries. (3)

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# Alumni Review

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# Institute Review

## The Student Center "Sanctuary"

If you are tormented and angry about what you regard as your country's violent trespass in another land, but cannot make yourself heard, what can you do?

If you are charged with directing an educational institution devoted to the responsible search for truth, what should you do?

Manifestations of these two basic questions pressed heavily upon the M.I.T. community early in November. There is no necessary conflict between them, and there was no physical conflict in Cambridge, either. But there were sleepless nights for many.

The episode began when members of the M.I.T. Resistance, who had officially reserved the Sala de Puerto Rico in the Julius A. Stratton Building for a "teach-in" on the evening of October 29, advanced their occupancy of the room by several hours to establish a "sanctuary" for J. Michael O'Conner, a 19-year-old Army private A.W.O.L. from Fort Bragg, N.C. Thereafter, until Tuesday, November 5, anywhere from 50 to as many as 2000 M.I.T. and non-M.I.T. students, faculty, and sympathizers shared the Sala with Mr. O'Conner around the clock—waiting for the federal agents to pick up their man. No one believed Mr. O'Conner expected immunity from arrest; he was simply here to provide focus for a nonviolent expression of opposition to U.S. military selective service policies.

### Dissent and Responsibility

Early in the week, M.I.T. President Howard W. Johnson explained to Boston newspapers that it was M.I.T.'s policy to "allow students to present their point of view without interference"—so long as in doing so they interfered with no one else and there was no interference with the law. He referred to his statement in November, 1967, when demonstrations against Dow Chemical Company recruiters prompted a dialogue on freedom and responsibility (see *Technology Review*, Dec., 1967, p. 54): "It is a principle of the university to permit, provide, and protect an environment where dissent is possible . . . . On the

other hand, it is important that such protest not become abusive or limit the reasonable rights of others."

There was an elaborate student organization at the "sanctuary" to help the protesters fulfill these same objectives. Students with armbands were designated as "marshals"; others served as "medics." Students with walkie-talkie radios were stationed outside the Student Center to warn of violence and/or the approach of the "feds." A commissary prepared food, there were seminars on the war and the issues it raises, and there was entertainment (including football and puppet shows) to shorten the long hours of vigil.

M.I.T. faculty and administration visited the "sanctuary" to observe—and some to support—the group, in which, it was variously estimated, members of the M.I.T. community numbered only 20 to 35 per cent. Jerome B. Wiesner, M.I.T. Provost, while admitting that "I sympathize with your position on the war and that is what this is all about," issued a statement making it clear that Mr. O'Conner had "no official status at M.I.T.," that faculty members who chose to bring him to classes—or to bring classes to the "sanctuary"—did so on their own judgment.

### A Transcendent Issue

Meanwhile, there were long conferences to assure that M.I.T.'s efforts to keep the campus "open" were appropriate and could succeed. Kenneth R. Wadleigh, '43, Dean of Student Affairs, told the M.I.T. Matrons that one of these was "one of the most remarkable conferences I have ever seen."

The problem at the meeting he described was how the student groups, responsible for allocating facilities of the Student Center, would resolve schedule conflicts for the Sala between the "sanctuary" and the Junior Prom, one of the top social events of the season.

Most members of the student government, reported Dean Wadleigh, "disapproved of the *modus vivendi* of the 'sanctuary' group. Yet they all agreed that the issue to which the protesters were addressing themselves so trans-



John Michael O'Conner

cended the impact of any other events scheduled for that room, that they believed, based on principle, that the 'sanctuary' should be allowed to remain."

### "Renewed Thought and Expression"

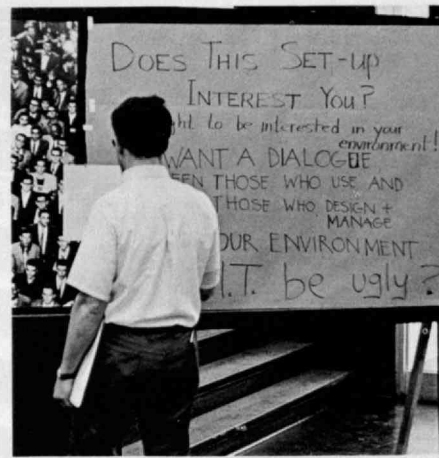
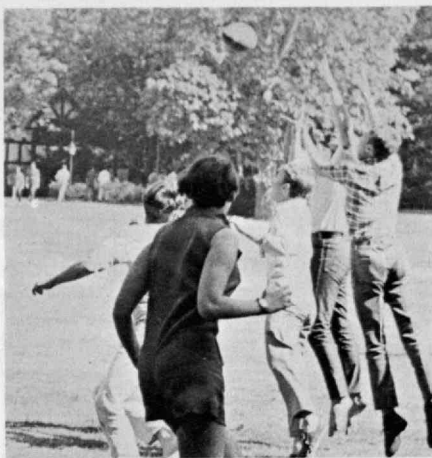
But by the beginning of "sanctuary's" second week, when the "feds" had failed to appear, student interest was weakening, everyone was tired, and the date for Junior Prom was fast approaching. "Sanctuary" moved to the fourth floor of the Stratton Building, the Junior Prom moved into the Sala de Puerto Rico with an elaborate formal ball, and the Military Police finally came for Mr. O'Conner at 7 o'clock on Sunday morning, November 10.

William Saidel, '69, a leader of the M.I.T. Resistance, was pleased with the results of eight days of "intense political activity. It caused renewed thought and expression on the part of everyone involved," he told *The Tech*.

President Johnson assured 300 alumni and wives attending the 1968 Alumni Seminar that, while he did not underestimate the risk of the episode to faculty or institution, he felt it important that M.I.T. continue to provide an environment in which everyone can grow in strength and understanding. He said, "We have made clear that we do not condone the involvement of a soldier who is A.W.O.L. from the Army, but his situation is a question for the authorities. And, as long as the situation here continues where people take full responsibility for their actions and do not obstruct and do not intimidate and do not threaten others, we intend to keep this campus open."



Freshman Weekend 1968 was the same—but different. There were the usual piles of forms to file and lines to stand in (longer than usual, because the computer broke down). But there were also words like “dialogue” and “environment,” and there was tough football at Wellesley—different indeed! (Photos: Richard M. Koolish, '68, and George J. Flynn, '69)



## The Freshmen

Freshmen are characteristically bright-eyed and bushy-tailed, closely involved in the quest for identity within the massive Establishment, masculine (one out of every 14 is a girl), and even homesick. At M.I.T., the majority of freshmen study, study, study. So much so, in fact, that some concern has been expressed as to how to protect them from being so responsive to purely academic pressure.

The result: this year's freshmen are being discouraged from worrying about grades through the introduction of a pass-fail system of minimal grading in all freshman courses. The experiment seems to be going well, despite the fact that no one has ever proved that if you take away the carrot the donkey will just keep on walking out of “self-motivation” pure and simple. While it is still too early to tell what this group will do, the signs point to the encouraging fact that these fresh guinea pigs do not feel caught in a test tube. “It's great to have a chance to explore your own interests,” said one. “I never let myself enjoy studying before,” said another, “and now I do.”

Defying traditional freshman skepticism about pledging during their first terrifying week at M.I.T., a special drive this year cosponsored by Dormcon and the Interfraternity Conference, I.F.C., resulted in a record rush week fraternity registration and pledges. The omens now bode well; for the next four years, campus fraternity life will be alive and well.

Another registration record was set by the I.B.M. system 360 computers which had been planned to relieve the short-comings of the human factors during freshman registration and scheduling. However, as things turned out, those same human factors had a rough three days of it, making up for the near complete lack of any operative piece of calculating equipment within miles. Thus, the brightest, biggest, most cosmopolitan freshman class M.I.T. has ever admitted met Murphy's Law, or, the Case of the Misfiring Machine.

There are other reasons why this year's freshmen are putting down their books



from time to time. After 103 years of splendid isolation, the Institute's gates have been scaled by Other Women: i.e., Wellesley College. While the exact number of Wellesley inmates who have been released into M.I.T. classes stands at a timid 77, word has it that an undisclosed number has joined with M.I.T. in different extracurricular activities. You can ride between the M.I.T. and Wellesley campuses 26 times daily by bus, if you choose. Cross-registrants can eat in the other college's dining halls, and the number of sports activities, mixers,

and dates per man-hour week has suddenly escalated enormously.

Of course, not only will freshmen be affected by the onslaught; we must dole out sympathy in proportional quantities to our brethren in the upper classes. However, other factors remaining the same, the Class of 1972 will suffer (or benefit) most from the Wellesley horse which has appeared within these gates of Troy; they are due to be besieged by them in classes for the next full, four years. Never had it so good.



Assuring fair employment practices on M.I.T.'s new chemistry building is one of the first tasks of James C. Allison, Opportunity Development Officer.

## The Care and Feeding of an Employment Problem

One of the biggest events this year in the M.I.T. Physical Plant and Operations and Personnel offices has been to sit down at the conference table with the Aberthaw Construction Company, general contractor for the \$6.3-million chemistry building project now under way on campus. The key to the meeting was Opportunity Development Officer, James C. Allison; the meeting's goal was to see if M.I.T. could make the phrase "equal opportunities," which has been required on federal contract paperwork for years, an actual fact.

"Some of the students around here will one day make decisions affecting the whole world," said Mr. Allison. "M.I.T. is a sort of United Nations. But what kind of experience do the students have if what we preach isn't visible: if they see a building going up, and hardly any black people on the scaffolding? We must put our own house in order."

Allison's new post is part of a special effort being made by the Institute to improve M.I.T.'s performance as an opportunity employer, similar to Avco, Raytheon, and other big area employers who have made a point of aiding employment for minority groups.

The goal is to "create the right climate" with Aberthaw and also with M.I.T.'s inplant hiring and promotion practices, explained Paul F. Barrett, Business Officer of the Physical Plant Office. "We hope that with the proper format and setting, progress can be made." Progress, in this context, meant getting contractors to conform to an M.I.T.-generated Affirmative Action Policy which asserts M.I.T.'s commitment by listing employment guidelines which all contractors must follow. "We plan to even talk with the subcontractors in the chemistry building job, so they too will know where we stand," said Mr. Barrett.

Since Aberthaw needs workmen, the climate seemed to be right for taking on more Negro tradesmen into the unions

Aberthaw uses. So Mr. Allison, benefiting from contacts gained while he worked in the Opportunities Industrialization Center in Roxbury, and benefiting also from his experience as a union official for the American Federation of Technical Engineers, submitted to Aberthaw several sources of available construction workers from the black community.

In a broader arena, M.I.T. has helped rally other big area employers with upcoming construction projects to a joint drive for equal opportunity employment. Last August, Harvard University, M.I.T., Northeastern University, Raytheon, the Polaroid Company, and others met to formulate group objectives. Representing the Institute were Philip A. Stoddard, '40, Vice President of Operations and Personnel, Walter L. Milne, Assistant to the Chairman of the Corporation, and Mr. Barrett. The group is now awaiting word from the Urban Coalition on how they can best fit in with the existing coalition plans for the Boston area, and some guidelines on the best way to proceed.

"This is one area where we felt we should face up to the realities of the situation together," Mr. Barrett explained. "There is a problem of discrimination, and there is also a problem of reluctance among some contractors. The idea was that as a group of influential owners, we could effect change. After all, we have one weapon: to refuse to invite someone to bid on the next job."

Finally, the issue of putting thine own house in order is generating excitement in another realm: in-plant training and promotions. "Most of our black employees are in the custodial and janitorial areas of the plant union," Mr. Barrett said. "Our main problem lies in working in our unions to offer training programs to insure the opportunity and the means to move up." Mr. Allison confirmed that, "it is becoming clear to the employees that supplementary training programs and other tools don't just help the blacks, nor will

they help just minority groups: everyone's chances of promotion will be improved."

"The unfortunate fact," Mr. Barrett said, "is that to make sure our employees in less skilled trades can advance to better levels requires a large dollar-figure, and, with the National Science Foundation cuts, and money the way it is now, training and apprentice-type programs are harder to get." However, he added that he thought a proposal for improved programs could win funds, nonetheless.

Mr. Allison stated that he felt he would spend most of his first six months on the job at M.I.T. gathering together information on the diffuse independent activities now going on at M.I.T. to help Negroes. For example, one group of three physics graduate students has interviewed approximately 40 faculty and laboratory staff members to see if they would be willing to offer on-the-job training in the laboratories to disadvantaged community youths who would then qualify for permanent jobs elsewhere. "We are also trying to measure the strength of their response," explained Truman Brown, '64, one of the graduate students making the study, "to see how much support there might be at M.I.T. for on-campus job training." "When we get the results of the study," James Allison said, "we'll have a better idea of where we can take that type of plan. Certainly something of the kind is needed."

Bringing about positive, progressive change at M.I.T. will be harder "because M.I.T. is so diversified and spread out," said Mr. Allison. "At a company like Raytheon, if the President says 'move,' then 7,000 people move." But M.I.T., he said, has so many different umbrellas under which different people and funds travel that marshaling change can be more complicated. However, he said he felt that the great advantage of M.I.T. was that "the atmosphere here is right; there are a lot of people here who want to help." It looks as though Mr. Allison's main job will be helping them to help.



## Self-Study Manager

John T. Fitch, '52, known to New England television audiences for his appearances as the M.I.T. Science Reporter over WGBH (Channel 2), Boston, has joined the M.I.T. Center for Advanced Engineering Study as Manager of Self-Study Subject Development.

In this post, according to Harold S. Mickley, Sc.D., '46, Director of the Center, Mr. Fitch will be in charge of "new multimedia self-study graduate engineering courses" planned for engineers in industry, government, and other educational institutions. Their purpose is to "make it possible for a large 'student body' of graduate engineers to further their education in the latest areas of science and technology," according to Professor Mickley.

The first of the courses, on "Probability Theory and Random Processes," will be available for test in the fall of 1969. The proposed program will include a text, problem book, study guide, and set of videotaped lectures prepared by M.I.T.'s C.A.E.S. with co-operation from WGBH, Boston's educational television station. Additional courses are also being developed by Mr. Fitch and members of the M.I.T. School of Engineering faculty.

## New Dean, Department Head, and Jackson Professor

Three changes affecting the leadership of the M.I.T. School of Engineering were announced by Howard W. Johnson, President of the Institute, early this fall.

Gordon S. Brown, '31, Dean of the School of Engineering since 1959, relinquished his administrative duties effective November 1 to become the first Dugald C. Jackson Professor of Engineering. As Jackson Professor, Dr. Brown will "give attention to research and education in his own fields (automatic control and computation) and to the continued development of technology and engineering on a national and international scale," President Johnson told the faculty.

Raymond L. Bisplinghoff, Head of the Department of Aeronautics and Astronautics, has succeeded Dr. Brown as Dean of Engineering. Dean Bisplinghoff first came to M.I.T. in 1946 and became Head of the Department in 1966 after a four-year leave of absence while serving as Associate Administrator of the National Aeronautics and Space Administration.

Rene H. Miller, the first H. Nelson Slater Professor of Flight Transportation at M.I.T., now heads the Department of Aeronautics and Astronautics, succeeding Professor Bisplinghoff. Professor Miller has been associated with the Glenn L. Martin Company, the McDonnell Aircraft Corporation, and Kaman Aircraft Corporation. At M.I.T. since 1944, he is known especially for his



John T. Fitch, '52



R. L. Bisplinghoff



Gordon S. Brown, '31



Rene H. Miller

work on helicopters and other vertical flight vehicles.

In announcing Dean Brown's new appointment, President Johnson paid special tribute to the late Dugald C. Jackson, "one of M.I.T.'s great educators," he said, who was Head of the Department of Electrical Engineering from 1907 to 1935. Like Professor Jackson, President Johnson said, Dean Brown has made "unique and imaginative contributions in the evolution of our educational philosophy, and we look forward to his continued influence in the growth of the Institute."

Dean Bisplinghoff's work at M.I.T. has been in the development of research and teaching in flight vehicle structures; he has been Director of the Aerodynamic and Structures Research Laboratory and Chairman of the Aerospace Research Division. For N.A.S.A. Dean Bisplinghoff was responsible for advanced research and technology in aeronautics and space, notably for programs planned to continue beyond the Apollo series.

## Growing Larger—Slower

Total operations of M.I.T. increased to \$214 million in 1967-1968—up 7 per cent over 1966-1967. But the growth was slower, than in recent years, Joseph J. Snyder, '44, Treasurer of the Institute, said in his annual report to members of the M.I.T. Corporation early in October. By comparison, the growth rate was 12 per cent from 1965 to 1966.

The 1967-1968 increase was related "largely" to increases in salaries and wages, Mr. Snyder told the Corporation; the Institute's total payroll in 1967-1968 approached \$100 million, he said.

A substantial increase since 1965 in student aid funds for scholarships and loans represents "a major change in the financing of the Institute's educational and general operations," Mr. Snyder told the Corporation. The figure has gone from 25 per cent of tuition income to nearly 50 per cent in the last 10 years, he said.

Gifts to M.I.T. in 1967-1968 amounted to \$25.8 million, compared with \$17.8 million in the previous year; bequests were responsible for much of the increase, Mr. Snyder said. Also, M.I.T.'s plant increased in book value from \$107.8 million to \$118.8 million during the year.

The Institute's invested funds grew from \$232 million to \$246.5 million at book value during the year, and they earned income at the rate of 6.7 per cent. Of the total investment income, more than half was used directly for current expenses.

Investment income has grown by over 70 per cent during the last five years, Mr. Snyder reported, while M.I.T.'s educational and general operations have grown by more than 60 per cent. Common stocks represent more than two-thirds of the endowment investment, but real estate investments are increasing, Mr. Snyder noted.

## An Education Development Fund For an "Historic Opportunity"

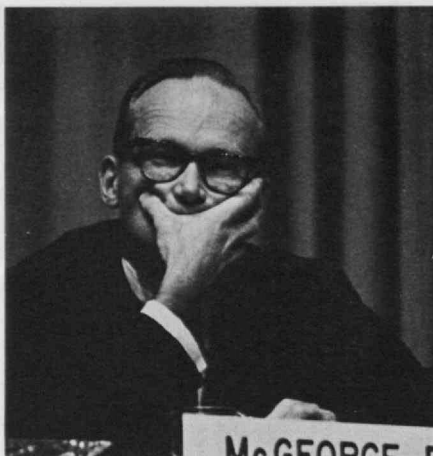
Edwin H. Land, President of Polaroid Corporation, has established a trust fund to initiate an Education Development Fund at M.I.T. At the present rate of dividend payments, according to James R. Killian, Jr., '26, Chairman of the M.I.T. Corporation who announced the plan this fall, the Fund will benefit by about \$480,000 annually for the next three years.

In a letter describing the plan and purposes of the trust, Dr. Land said he wished "to assist M.I.T.'s current program for the advancement of teaching and learning and its program for providing its students with opportunities more fully to realize their inherent creative capacities." The Education Development Fund, he said, should be used to help design new curricula and curriculum materials, for research in the learning process, to develop experimental courses, and to further "the sound use of technology in teaching."

In establishing the fund, Dr. Land referred to two lectures given by him at M.I.T. in 1957 and 1960, stressing the importance of a student's early involvement in original scientific experience and the need for "a deeply rewarding working life for every man in all walks of life." These goals, he said, could only be achieved by an educational institution which goes far beyond today's technological education "in its demands for insight into human motivation and human reward."

Dr. Killian and Howard W. Johnson, President of M.I.T., joined in a statement paying tribute to Dr. Land for M.I.T.'s "historic opportunity further to humanize the atmosphere and process of education, to enrich the relationship of student to professor, and in general to support M.I.T.'s deep commitment to the advancement of undergraduate education."

McGeorge Bundy, President of the Ford Foundation, found M.I.T. a demanding and lively audience for his call to de-escalate by new negotiations "with all the firmness and steadfastness at our command." (Photos: Owen D. Franken, '68)



## Discipline for De-escalation: Bundy

If the United States decides to de-escalate the war in Vietnam, and "begins to lift the burden of war from this society," how can the needed return-to-peace policies be accepted and adopted? Such was the question posed by speaker McGeorge Bundy, President of the Ford Foundation, at the second of the 1968-1969 lectures in the Karl Taylor Compton Seminar Series this fall.

Bundy said the nation needed to move away from further debate on whether earlier decisions on Vietnam were right or wrong.

Rather, he urged, we must vigorously pursue measures to reduce the dimensions of our engagement in Vietnam. "The energetic research for a negotiable base and the determination to de-escalate will demand of our people more discipline than at any other time since the Cuban crisis," Bundy said. "We are torn people; the issues are complex; and our will to negotiate and de-escalate has not been made any stronger by those who argue that it is a simple matter."

Bundy, who served in the White House as an adviser on foreign policy to the late President John F. Kennedy and to President Lyndon B. Johnson, discussed three principal roadblocks to acceptance of the path of de-escalation: the military, other nations, and our own citizens.

"De-escalation imposes on the military topside co-operation for an undertaking with which it has no sympathy," Bundy said. "President Eisenhower was the only recent President who felt superior to the military establishment. The military will find it difficult to accept political strategies involving a lower-level war.

"We will need all the firmness and steadfastness at our command to negotiate with other nations of the world. Our relations with smaller nations cannot be those of master and puppet. The negotiation with the Saigon government will be terribly difficult, and negotiations with the Communists hardly less difficult.

"Finally, we will find it most difficult to defend a changed policy at home. Support will not come easily in this polarized society. The alternatives are unacceptable, however, and we must press our case vigorously."

Two forces will be available to a new administration seeking to bring about a lower-level war, Bundy said. "We are in Vietnam in force. We are on the ground there, and the fact that we are on the scene will strengthen our bargaining position with both allies and enemies. Secondly, a new administration has a new chance that an old administration does not have. In my judgment, the 1965 decision to stand and fight was right; now we must take advantage of the present-day situation and move forward from that position."

## Affiliations Query Launched

A special committee of both faculty and Corporation members will begin work this winter on a study of M.I.T.'s multi-institutional affiliations. The committee appointments, confirmed this fall by M.I.T. President Howard W. Johnson, stemmed from many different causes, among which was a discussion during a faculty meeting last May on M.I.T.'s involvement in the Institute for Defense Analyses (I.D.A.).

Faculty Chairman Walter A. Rosenblith announced during a recent faculty meeting that Gordon S. Brown, '31, Dugald C. Jackson Professor of Engineering and retiring Dean of the School of Engineering, will chair the committee. Professor Rosenblith said that to his knowledge, this was the first committee in recent M.I.T. history to be made up of both faculty and members of the Corporation.

Corporation members to serve with the group are Vannevar Bush, Eng.D.'16, James B. Fisk, '31, Dr. George W. Thorn, and David A. Shepard, '26.

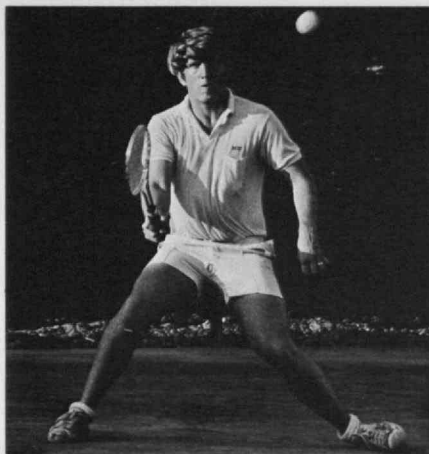
Committee members from the faculty are: Frank Press, Head of the Department of Geology and Geophysics; Ascher H. Shapiro, '38, Head of the Department of Mechanical Engineering; John F. Elliott, Sc.D.'49, Professor of Metallurgy; Robert I. Hulsizer, Ph.D.'48, Professor of Physics; Salvador E. Luria, Sedgwick Professor of Biology; Eugene B. Skolnikoff, '49, Associate Professor of Political Science; and John C. Sheehan, Professor of Organic Chemistry.

## Social Inquiry

Like the proverbial apple which fell on the grass next to Isaac Newton one rainy English day c. 1665, the problems thought to derive directly or indirectly from the war in Vietnam have collided with the collective cerebral power of M.I.T., sparking as many diverse reactions and new problems. One such reverberation of "The Movement," as it has come to be called in Cambridge, is happening in education, now that Noam A. Chomsky, Ward Professor of Modern Languages and Linguistics, and Richard W. Wertz, Assistant Professor of History, both prominent in "The Movement," have launched their own experiment in education titled "A Seminar of Social Inquiry."

The course is deliberately not being offered as part of the catalogue curriculum, explained Professor Wertz, "to make a point of the fact that one can do serious academic work not for credit." Through the class about 200 faculty and students can meet in small groups to research and discuss social problems, and, more specifically, the problems confronting M.I.T. Topics? Try the responsibility of M.I.T. vis a vis its students, Cambridge, educational innovations, the Pentagon. The course founders are hoping not only for R & D but policy formulations as well.





There was nothing very different about the 1968 fall sports season: S.A.E. won the intramural football title, the tennis team broke records (one team always does), there was action aplenty on the soccer field—and peace aplenty on the golf course. (Photos: Jeffrey M. Reynolds, '69, and Richard M. Koolish, '68)



### A Strategy of Winning

"M.I.T. is where it's happening," explains Professor Wertz, referring to the problem of decisions about the social and military uses of technology. "So M.I.T. should start studying what these problems really are. It might turn out that if we actually turned down certain military contracts for moral reasons, we couldn't afford to sustain the Humanities office I'm in!"

But while he emphasized a spirit of scholarly inquiry in his course, Professor Wertz said that action would not be out of the question. Indeed, class had met only twice when a small group of seminar students decided that the experiment with pass-fail grading for freshmen should be extended. So they passed out petitions of support for a new concoction: pass-pass. According to *The Tech*, a spokesman for the seminar group "sees pass-pass as the beginning of a re-evaluation of education which will include elimination of required courses; a re-evaluation of course organization, a better advisory system, and more reliance on self-motivation."

### New Study on Old Questions

One group concerned with M.I.T.'s relation to Cambridge is undertaking work on the perennial problem of town-gown. Another is studying "M.I.T. and the Warfare State" for a starter; they plan to move on to the implications of "pure" research and the amount of control a scientist should have over the fruits of

his labors. Still another group undertakes the question of current education at M.I.T. "to make the M.I.T. experience more considered," and educational innovations the Institute has tried, and if, why, and how they failed.

### But Do They Really Understand?

Having enough of everything is not enough—at M.I.T. just as everywhere else in the world. Feelings are facts, and understanding people is as important as understanding a theorem. There are quite a few people who are concerned about what is wrong in the world and what can be done about it—but most of them are apolitical.

If there were a transcript of the 1968 Guidance Conference, these statements—by M.I.T. faculty and students—would be prominent in it. Obviously, the weekend was not exactly "business as usual" for the 60 high school guidance officers from throughout the U.S. who were M.I.T.'s guests from October 10 to 12.

The stage was set by Howard W. Johnson, President of M.I.T., who described three touchstones of M.I.T.'s educational effort: quality, accessibility, and individuality of opportunity.

Though its method may be very quantitative, President Johnson said, the goals of an M.I.T. education are among the most qualitative, for M.I.T.'s is a liberal education, in the sense that it truly lib-

erates individuals from "misconceptions and uncertainties, bringing to each student a method for understanding the world in which he lives." Although it is an education based on science, President Johnson said, from it "many students will emerge as generalists."

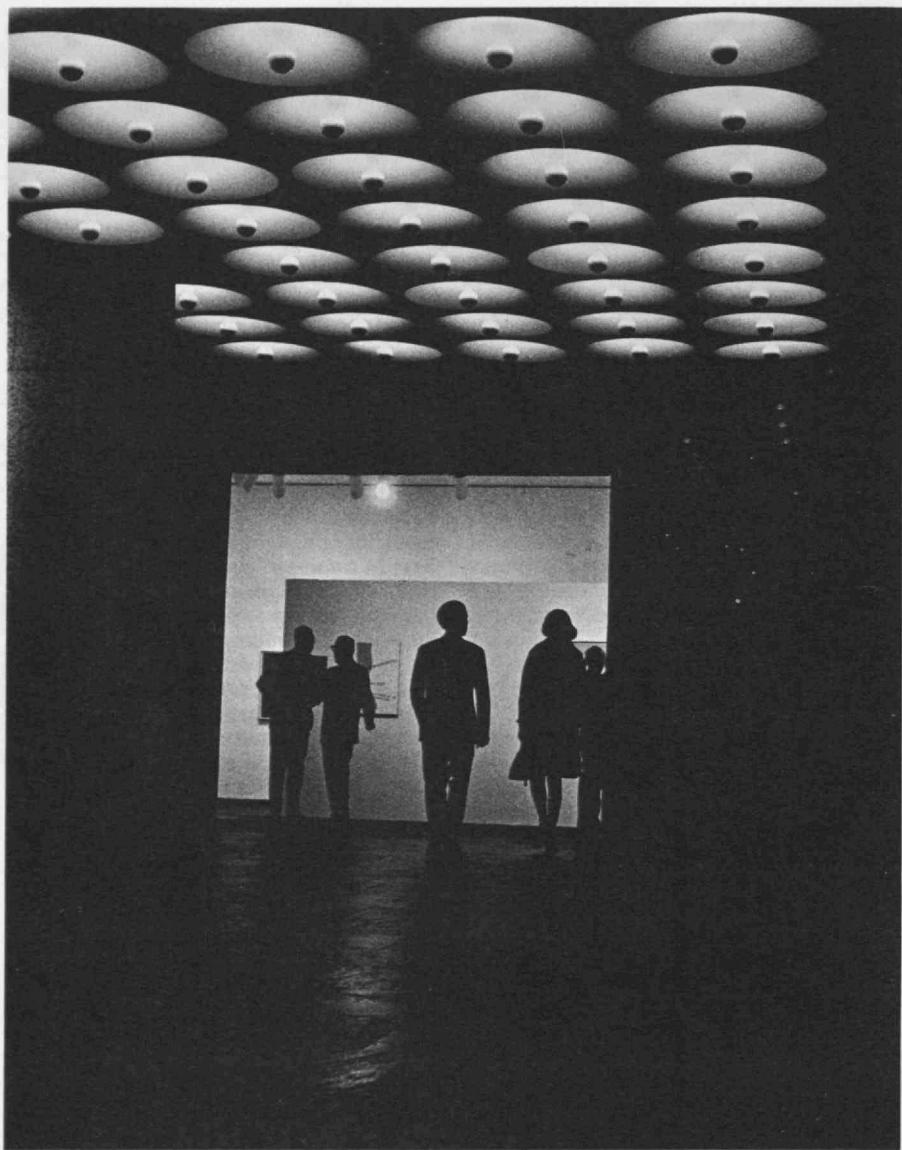
The problem of how M.I.T. may attract, hold, and serve the disadvantaged student who is fully qualified but unprepared is "the most vexing problem facing our society," said President Johnson of his second touchstone. We do not know the answer, he admitted, but we are committed to finding it; "in some ways we are more intent and more earnest about this effort than anything else at M.I.T."

How these broad purposes relate to the specifics of the M.I.T. experience was the focus for conference discussion for the next 24 hours. At one remarkable session, while four students described in fairly conventional terms the nature of athletics, fraternities, and dormitories at M.I.T., Michael A. Albert, '69, told the high school representatives that "people who come to an institution like M.I.T. have reaped the benefits of society and have a responsibility . . . yet here, any group that concerns itself with more than immediate self-interest gets defined as 'radical.'" He said that a large portion of the students shared his discontent, although "most of them are apolitical."

### Solid but Unspectacular

With the season nearly ended, those who cared about the win-loss record in M.I.T. intercollegiate athletics had only a few high spots to rejoice about. The records belonged to the tennis team, which had its most successful fall season in history. The traditionally strong sailing team won the Finn Trophy for single-handed races and the White Trophy for the New England Sloop Championship, and the co-eds' sailing team was second in the Greater Boston Radcliffe Invitational. Crews entered in the "Head-of-the-Charles" regatta turned in what *The Tech* called "solid but unspectacular performances," but Edward Van Dusen won the junior lightweight singles race. The golfers repeated their 1967 victory in the Sir George Williams Tournament at Montreal.

# Alumni News



## Alumni Center of New York: An Opening at the Whitney

Over 500 members and guests of the M.I.T. Alumni Center of New York were received at the Whitney Museum of American Art on October 9 to honor Dr. and Mrs. Julius A. Stratton ('23) and to view the Museum's exhibition of contemporary painting and sculpture. It was the season's opening event for the Center, and it was a uniquely successful tribute to the planning of Mr. and Mrs. Angus N. MacDonald ('46); he is General Chairman of the Center for 1968-69. They had been assisted in planning by members of the M.I.T. Art Committee, many of whom were among the distinguished guests. Other special guests included Hyman Bloom and Robert Motherwell, artists whose works were showing in the Museum, and Marcel Breuer, the architect of the Museum building.

Guided tours of the Museum led guests to areas of behind-the-scenes activity as well as to the exhibition halls. But the main lobby was the principal focus of interest.

## The Beaver: A New Yorker?

The following item appeared in the newsletter of the M.I.T. Club of New York.

Many fine contributions have passed back and forth between the alumni of New York and the M.I.T. campus, but outstanding among them must be numbered the beaver mascot. It was at the annual dinner of the Technology Club of New York on January 17, 1914, that the members presented M.I.T.'s President MacLaurin with a pair of "handsomely mounted beavers and the suggestion on behalf of the club that this animal be duly adopted as the mascot of the Institute on account of its unique industry and its modest and inconspicuous acquisitiveness, symbolical of Technology."

That may not be the way you heard it, but it happens to be true.





New York's Whitney Museum of American Art, always an exciting visual experience, came to special life for 500 New-York-area alumni and their guests on October 5 at the opening reception of the Alumni Center of New York season. Among those present were: (top) Angus N. MacDonald, '46, General Chairman of the Center, and Jerome B. Wiesner, Provost of M.I.T.; (center left) David A. Shepard, '26, Mr. and Mrs. Harold W. Fisher ('27), and President

and Mrs. Howard W. Johnson, of M.I.T.; (center right) Lawrence B. Anderson, '30, Dean of Architecture at M.I.T., and Ieoh M. Pei, '40; and (below left) Mrs. Karl T. Compton, the wife of M.I.T.'s ninth President. (Photos: Owen D. Franken, '68)

A one-day course in modern economics brought over 50 members of the M.I.T. Alumni Center of New York and their guests to the Drake Hotel on October 1. They celebrated the coming (within two years) of the trillion dollar economy (gross national product) in the U.S., and when you get there, said Charles P. Kindleberger, Professor of Economics at M.I.T., "you have to do everything at once." The pictures show luncheon with the seminar speakers (right, at lunch, William M. Helmuth, Deputy Assistant Secretary of the Treasury), the attentive audience, and the informal "breaks."



## Politics and Sociology in the Trillion Dollar Economy

The trillion dollar economy (gross national product) is only two years away, and though its achievement may seem to be a major landmark, the laws of economics will be no different. The changes—if there are any—will derive from political and military affairs.

No one professed surprise at this conclusion from four speakers at a day-long seminar for more than 50 participants arranged by the M.I.T. Alumni Center of New York this fall. A more conservative approach to national economic policy and a reorientation of government spending after the Vietnam conflict deescalates were the two influences upon which the speakers seemed most ready to agree.

The question of inflation, said Charles P. Kindleberger, Professor of Economics at M.I.T., is "a critical, fundamental social issue." Underprivileged Americans benefit from a tight labor market which characterizes the aggressive, inflationary economy. But professional workers and older people are hurt when the value of money declines. He concluded that national economic growth will continue in the coming decade, but the "super-growth" characteristic of recent American experience will not continue. This means, he said, predicting a stop-and-go economy; "we have not after all solved the business cycle."

The continuing increase—almost automatic, so long as gross national product continues to rise—in tax income to the federal government is a very special safeguard for economic control in the future, said William F. Hellmuth, Deputy Assistant Secretary of the Treasury (Tax Policy). There is "irresistable and irreversible pressure on government at all levels to play an increasingly active role in economic affairs," he said, and much of it stems from the increasing competition for budget resources. Even if the needs in Vietnam should soon be reduced, he said, there are vast new problems to claim more tax income—federal commitments in education and welfare and the need for commitments on urban problems, pollution, and public housing.



If there is a \$12 to \$15 billion annual increase in tax revenue built into the U.S. tax system, there are built-in spending increases of \$8 to \$9 billion in federal programs—which leaves a very small percentage of the total revenue really available for manipulation of the economy.

A better assurance of an aggressive economy in the future would come from giving encouragement to technological innovation, said Robert A. Charpie, President of Bell and Howell, Inc. About half of the growth in U.S. gross national product since 1950 can be attributed to innovation—new products and new ways of making and using old ones. The future economic success of the U.S., he said, may depend on how well and quickly we can learn to foster and capitalize upon new technology.

Through all this, the mood of the country seems to be conservative, said A. Gary



Shilling, Manager of Economics for Merrill Lynch, Pierce, Fenner and Smith. That means, he said, that government spending on social programs is likely to be reduced, that there will be post-Vietnam military expenditures on weapons systems and that policy emphasis will shift from full employment to price stability. But inflation, he said, will remain "a fact of life."

## To Alumni Subscribers:

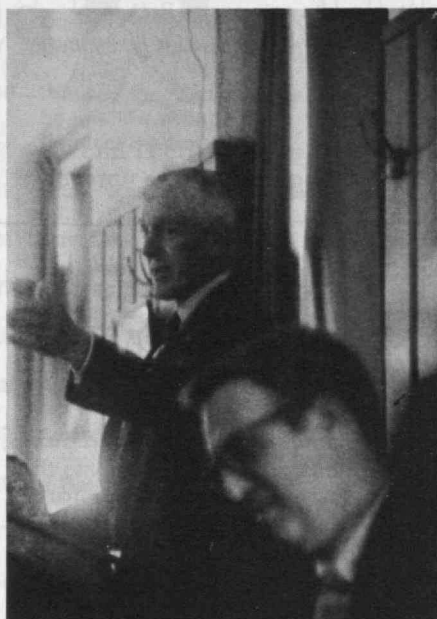
*Technology Review* is now conducting a campaign to obtain subscription orders from non-alumni. We have been unable to verify all of the lists which are being tested, so it is probable that some alumni who now receive *Technology Review* will be invited to subscribe. We apologize for the duplication and ask your forbearance.—J.I.M.



## M.I.T. Club of Boston: "Massachusetts Pahses"

Leverett Saltonstall, the Massachusetts Republican who retired in 1967 after a distinguished Senate career, proved that he had lost none of the old "pro's" touch when he spoke at the year's first meeting of the M.I.T. Club of Boston on October 10, at the Union Oyster House.

In informal remarks which ranged broadly over partisan and non-partisan political issues, Mr. Saltonstall described his role as Chairman of the Massachusetts delegations at many Republican National Conventions ("Massachusetts Pahses"); noted that "you can't get mad at Hubert," no matter what else you have to say about him; and gave a serious defense of the present system of national conventions for the selection of party candidates.



A popular primary instead of a convention, said Mr. Saltonstall, would mean "several months of demagoguery" and greatly increased political expense during the necessary primary campaigns. The advantage of a convention, Mr. Saltonstall told the M.I.T. club members, is that its delegates are experts, selected because they know the candidates, the issues, and the business of politics.

## Deceased

Frederick B. Dawes, '98, August 21  
Hervey J. Skinner, '99, August 5\*  
Charles F. Gardner, '02, August 5  
John F. Davis, '09, September 5\*  
Frank F. Bell, '10, September 23  
Alexander W. Yereance, '11, September 25\*  
John E. Crowley, '12, August 11  
Donald B. Armstrong, '13, August 24  
Charles P. Fiske, '14, August 9  
Allen Abrams, '15, August 9\*  
Stanley Barker, '16, August 2\*

Paul Hatch, '16, May 4  
Harold C. Alley, '17, June 8  
Rudolph Beaver, '17, August 28\*  
Gilead D. Morse, '17, July 11\*  
Harry P. Azadian, '19, January 28, 1967  
Carlos Krebs, '19, August 22  
Edwin Morgan Pickup, '19, July 27\*  
Mrs. John B. Woodward, '19, June 20  
Herbert F. Bates, '20, July 29  
Everett Fuller, '20  
Willard A. Emery, '21, September 2\*  
Sherwood F. Brown, '23, August 21  
Batist R. Hauelsen, '23, September 19  
James V. O'Connor, '23, May 10  
Alfred J. Perry, '23, June 16  
Albert F. France, '24, January 9  
R. Massey Williams, '27, July 30  
Argyle C. Abbott, '28, July 13  
Lawrence Berk, '28\*  
Swanton D. Dalton, '32, July 2  
George R. Green, '32, May 29  
Charles K. Jones, '32, September 11  
Merrill C. Pendleton, '32, May 21  
Frank S. Coyle, '33, August 17\*  
Edward S. Goodridge, '33, October 12\*  
Faustino Andreoli, '35, September 17\*  
J. B. Chapman, '35, July 16\*  
Philip Lucas, '39, July 26  
Jack J. Kriz, '41, August 31  
Arthur W. Weber, '41, September 14  
Harold L. Humes, Jr., '49, January 26\*  
Edward B. Mikrut, '50, July 28  
Samuel Fine, '53, February 22  
Akos D. Szekely, '67, September 11  
Peter J. Eloranta, '68, August 25\*  
\*For further information see Class Review

## Alumni Calendar

**New York**—December 4, 12 noon—luncheon at the Park 100 Restaurant, Park Ave. and 40th Street. "The Business Investment Climate of 1969," A. Gary Shilling, Manager of the Economic Unit, Merrill Lynch, Pierce, Fenner and Smith, Inc.

**Manchester, N.H.**—December 4, 6:30 p.m.—dinner meeting. "Local Problems in Education," Nathaniel H. Frank, '23, Professor of Physics, M.I.T.

**Baltimore**—December 5, 6:30 p.m.—dinner at the Holiday Inn (downtown). "What M.I.T. Is Doing on Urban Affairs," John F. Collins, Visiting Professor of Urban Affairs, M.I.T.

**Cape Kennedy**—December 5, 12 noon—luncheon at the Ramada Inn, followed by a report on the 1968 Alumni Officers' Conference by John D'Albora, Jr., '34, in the Martin Marietta Conference Room across the street.

**Chicago**—December 7—Sightseeing tour of historic and new examples of noteworthy Chicago architecture.

**Fairfield County**—December 12, 6:15 p.m.—dinner at the Clam Box (Westport). "Maximum Use of Infrared Wavelengths," R. Bolling Barnes, President, Barnes Engineering Co.

**Los Angeles**—January 6, 3 to 9 p.m.—management seminar at the Interna-

tional Hotel. Paul H. Cootner, Ph.D.'53, Professor of Finance, M.I.T.; William F. Pounds, Dean of the Sloan School of Management, M.I.T.; and Edward B. Roberts, '57, Associate Professor of Management, M.I.T.

**Framingham, Mass.**—December 11—Tour of the Civil Defense Center, Route 9, at 7:30 p.m. followed by dinner.

**Boston**—January 9, 12:15 p.m.—luncheon at the Union Oyster House. "Current Trends in Labor Relations," Charles A. Myers, Sloan Fellows' Professor of Management, M.I.T.

**Denver**—January 23, 12 noon—annual meeting at the Denver Athletic Club.

**Philadelphia**—January 23, 6 p.m.—dinner at the Union League. "Man and His Brain—New Disclosures on Perception, Memory and Action," Hans-Lukas Teuber, Professor of Psychology, M.I.T.

**Newark**—January 24—visit to the Edison Laboratory and Museum, West Orange, N.J.

**Baltimore**—February 6, 6:30 p.m.—dinner at the Engineers Club. "Housing and Community Development," Robert C. Embry, Jr., Commissioner of Housing and Community Development, City of Baltimore.

**Hartford**—February 7—joint meeting with the Wellesley registration program. M.I.T.-Wellesley registration program.

**Fairfield County**—February 18, 6:15 p.m.—dinner at the Clam Box (Westport). "Venture Capital Sources for Small Business," Charles E. Kendall, Vice President, Franklin National Bank.

**Mexico City**—March 13 to 15—regional conference at the Garden City Hotel. James R. Killian, Jr., '26, Chairman of the M.I.T. Corporation; Nevin S. Scrimshaw, Professor of Nutrition, M.I.T.; Secor D. Browne, Associate Professor of Flight Transportation, M.I.T.; Patrick M. Hurley, Ph.D.'40, Professor of Geology, M.I.T.; Robert A. Alberty, Dean of the M.I.T. School of Science; and others.

**St. Louis**—April 12—regional conference at the Chase-Park Plaza Hotel. Howard W. Johnson, President of M.I.T.; Samuel A. Goldblith, '40, Professor of Food Science, M.I.T.; Irwin W. Sizer, Dean of the M.I.T. Graduate School; Raymond L. Bisplinghoff, Dean of the M.I.T. School of Engineering; John F. Collins, Visiting Professor of Urban Affairs, M.I.T.; and others.

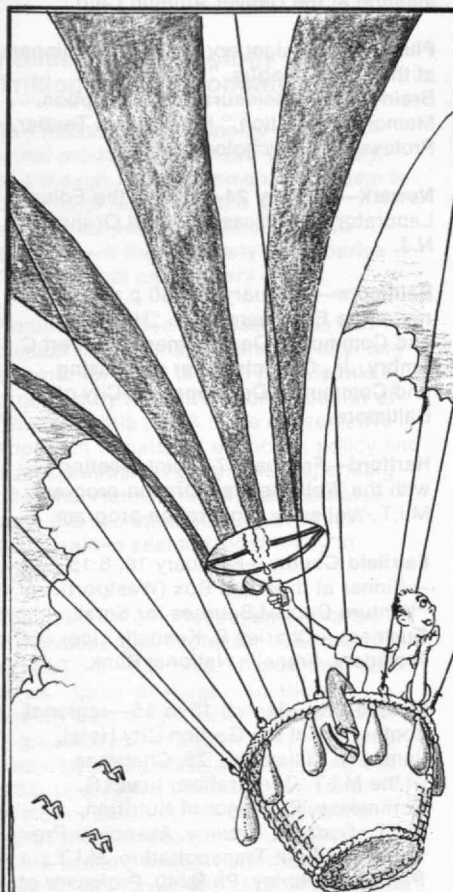
**Class Reunions**—June 14-15, 1969.

**Alumni Day**—June 16, 1969.

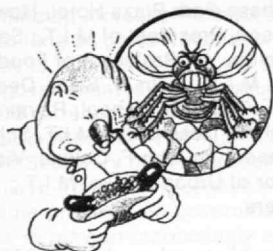
Alumni who travel are invited to attend these Alumni Club programs.

## ALUMNI as noted

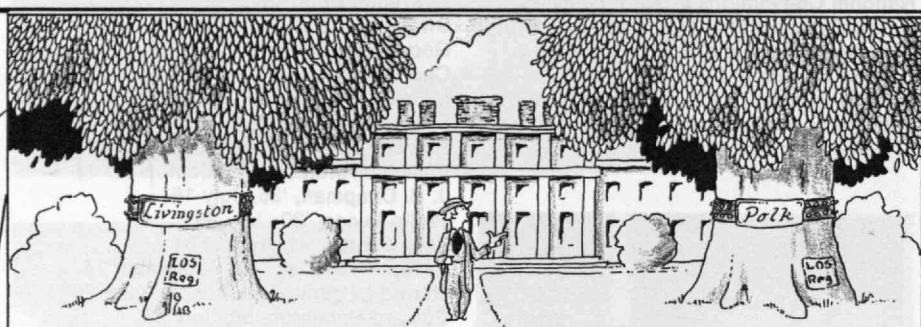
Some recent Happenings  
as related in the Review's Class Notes section



Air-minded D. Reid Weedon'41 has switched from gliders to hot-air balloons. "More relaxing."



Food and Drug Administration's Richard Stein'62 has developed a process that discloses fruit flies in relishes, beetle wings in cocoa, other insectivora.



On his spacious Louisiana plantation Livingston Ferris'11 has two trees registered with the Live Oak Society under the names of "Livingston" and "Polk."

### POLLUTION!

Warning against noise pollution, Vincent Salmon, PhD '38, says that a hearing conservation program is needed.



Jim Prigoff '47 won the National Squash Tennis Championship....



for the 7th time!

At the '63 reunion "Frank Model came out on top in the least hair contest"



Albert M. Bottoms'62 directs an Operations Research Task Force in the Chicago Police Department

H.B.KANE



At the '43 on-campus reunion, classmate Bill Laird was the cause of some confusion ~ he's a President Johnson look-alike.



Jim Bartsch'55, a non-golfer,



is the father of the one-piece golf ball, relatively indestructible, "the golf ball of the future."



# Class Review

## Of Note

- '05 The Ancient Mariner . . . a 3rd Class Seaman?
- '12 Do You Remember?  
Rhodes on Humanology
- '16 Housing for "Senior Citizens"  
Longfellow wrong?  
Pennant Predicted
- '17 Truly "Remarkable" Treasurer
- '21 How Does Katy Do?
- '27 Back to the Halls of Ivy
- '28 Computer Congratulates
- '39 A Debatable Item
- '47 Award for Apollo's TV Camera
- '49 A Reunion First
- '51 Wanted—Cars Under 6 Inches Long
- '55 A Late Tip on the Market
- '56 The Boston Computer Group  
Seeks Dialogue
- '57 A Senator from M.I.T.?
- '59 People More Important Than Things  
Controversial Comment on the SST
- '62 Project Brilliant
- Course VI  
Interface Between Technology and  
Investment

Copy for this issue of *Technology Review* was due from your Secretary on October 10. Information reaching him after that date will be reported in the January issue.

## 95

Glad to report that a telephone chat with **Luther Conant** in a nursing home in Connecticut revealed that he will be 96 years of age on December 21st. He is happy to report that he is in no pain and moves about in his room.

We are the two remaining members of the Class of 1895 and seem to be doing fairly well for a couple of "youngsters" aged 95 and 96!—Season's Greetings to all.—**Andrew D. Fuller**, Secretary, 1284 Beacon Street, Brookline, Mass. 02146

## 96

Your Secretary spent most of the summer in Plymouth, which some of you will remember as the home of **Bill and Henry Hedge** who were in Course IX. Cathy Hammond, Henry's daughter, called on the Secretary one sunshiny afternoon and reported that her brother, Elliott, had retired from the Trust Department of the bank on his 60th birthday, as he had said that he would. His secretary telephoned one morning to ask if he were coming in and, much to her surprise, learned that he had meant what he had been saying for some time. The report is that all of Henry's children, grandchildren and great grandchildren are happy and healthy.

The clambake at the Plymouth Yacht Club on the Fourth of July is always a gay affair and many former members come as guests of the present members. I was there and greeted the three daughters of Bill Hedge and enjoyed their reports of growing families, one of which is thriving in California. Susan, the oldest, has been living on the West Coast most of her married life and Lucia and Alice with their young families are still enjoying the climate on the south shore of the East Coast.

I do hope I will receive some news of our classmates, but news of their children is the next best.—**James M. Driscoll**, Secretary, 129 Walnut Street, Brookline, Mass. 02146

## 98

GREETINGS OF THE SEASON TO YOU AND BEST WISHES FOR EVERY BLESSING AT CHRISTMAS.

When I wrote for the previous issue, it was July and I was on my way to Alaska. My husband, Harold Jones, and I spent two months with our travel trailer. Now it is October and I can report that we left June 21 to be gone until Labor Day, crossed into Canada at 1,000 Islands Bridge, west on the Trans-Canada Highway and north on the dusty Alaska Highway. All enjoyable, interesting places, skyline drives, the Stampede in Calgary, the "goldrush" areas (Whitehorse and Dawson in the Yukon, and Fairbanks and Valdez in Alaska). We were lucky to get pictures of Mt. McKinley when we stayed in the Mt. McKinley National Park. We liked Alaska, scenic grandeur of snow capped mountains and Alpine flowers, the light all night, the big cities, vast wilderness, the ocean, the warmth of climate and of people. Several Alaskans entertained us in their homes. I thought of you gentlemen many times, hoping that you were having a pleasant summer. It was too difficult to write to you, either because we were driving along, or because I was preparing a meal in the trailer.

Having heard from no one since May, this news is mostly from your acting secretary. Edith Ames wrote on May 21 regarding her father, **Joseph W. Ames**. "He will not be able to attend the M.I.T. Class of 1898 reunion. He is 92 years of age and had to give up work last fall because of a weak heart and failing eyesight. He and Mother, who is also 92 years old, manage to get around the house nicely."—**Audrey Jones Jones**, Acting Secretary, 232 Fountain Street, Springfield, Mass. 01108

## 99

**Hervey Judson Skinner**, Course V, the son of Thomas Judson and Harriet Brown Skinner, was born in Wakefield, Mass., October 7, 1877, and died August 5, 1968. A graduate of Phillips



A panorama of the "gold rush" area overlooking Dawson, Canada. To the left of and below Mrs. Jones is the Klondike, at the upper left, the Yukon.

Academy, which gave him citations for his service as Class Agent, he received a B.S. from M.I.T. in 1899. Skinner became a research chemist with Professor Arthur A. Neyes of M.I.T., working on methods of analyzing rare metals. In 1902, then Vice President of Arthur D. Little, Inc., of Boston, he organized Skinner & Sherman, Inc., which established a national reputation as analyzing and consulting chemists. Hervey married Grace May Elliot of Wakefield on October 26, 1908; he retired in 1949, only to become interested in numerous investigations of the relationship between textiles and moisture.

Hervey J. Skinner lived during discoveries in biology, chemistry and physics. In over two score organizations he did his share so thoroughly that he received many honorary memberships for over 50 years of active service. On his 90th birthday, large groups showed their gratitude for his years of useful help in local activities which made Wakefield a nice town in which to live. He took a special interest in class reunions and his effectiveness as a class agent won him a special citation in 1967 for his success. We extend our deepest sympathy to Miss Flora Elliot Skinner and thank her for her years of help in keeping the class records and correspondence for many weary hours.—**Percy W. Witherell**, Secretary, 1162 West Street, Wrentham, Mass. 02093

## 03

Well, classmates, you have read the joyful news of our 65th 1903 Class Reunion; a dream fulfilled for us and a goal for all present and future alumni of M.I.T. to surpass. Yet we must acknowledge that our varied paths are nearing the horizon but with the dynamic fortitude of our Beaver Standard, we shall carry on.

A cheerful note came from **Adolph Place**, so pleased that his autobiography and picture had been displayed in the previous *Review*. Your Secretary wished to acquaint his classmates with Adolph's interesting career and hopes to have more classmates follow likewise. This innovation enlivens our interest in news of our fortunate remaining group. We heartily extend our best wishes for Adolph's 92nd birthday celebration on December 21.

**Jim Welch** writes that he has now decided to retire at a new address: 500 Isceola Avenue, Winter Park, Fla. There he is enjoying the companionship of the University Club, that boasts of 15 M.I.T. graduates from '99 to '44 and also two M.I.T. members who left before attaining their degrees.

**Stan Foster** enjoys our class news in the *Review*; he works about his place two hours every day, then takes a rest. He is so modest about his autobiography, that your Secretary desires to visit Stan at his home in Lowell, Mass., and secure his data "straight from the horse's mouth," a phrase that vividly recalls our "horse and buggy days" of yore.

**Howard Pew**, who graciously started our class autobiographies and had his photo in the November, 1966, *Review*, has written of his family's being honored through his brother, Joseph Newton Pew, Jr., an alumnus of Cornell University, '08. A professorship in engineering and associate fellowship were donated by his widow at a luncheon, May 10, with Howard and his family present. A unique feature of the endowment provides for a person to do research in direct support of research by the Pew Professor himself. This generous gift is but one of many others to the alma mater and to civic betterment.

We learn from our classmate, **Arthur Gibbs**, of Brockton, Mass., of the passing of Charles F. Gardner, '02, suddenly, at his home in East Sandwich, Mass., on August 5. Charles was employed as an engineer in the transfer of overhead electric systems to underground conduits at Manchester-by-the-Sea, in 1905, was next employed in several electric plants in Maine, followed by employment as Superintendent of the Electric Power Station at Plymouth, Mass. During the later years of retirement, he operated an electric supply and service station at Buzzards Bay, Mass. Charles is survived by his widow and two sons, also a daughter by a former marriage.

**Jose H. Aguilar**, passed away at his residence, Ave Morelina 192 PTE., Hermosillo Sonora, Mexico, April 3 (news received from his grandson). Jose was a devoted alumnus of M.I.T., as noted by his activity at the yearly Fiesta in Mexico along with his extending cordial hospitality to attending classmates.—**John J. A. Nolan**, Secretary, 13 Linden Avenue,



Somerville, Mass.; **Augustus H. Eustis**, Treasurer, 1428 Canton Avenue, Milton, Mass.

## 04

Dr. **Howard Moore** passed away in June, 1968. You will remember Howard took his freshman year at M.I.T. with us and at the end of the term decided to become a doctor and transferred to Harvard where he graduated later with an M.D. . . . News seems to be very scarce. I suppose everybody is out campaigning for the presidential election. No one seems to be traveling so I guess we will have to wait until some of our classmates get down to the business of sending us some news.—**Eugene H. Russell, Jr.**, Secretary, 82 Stevens Road, Needham, Mass.

## 05

Last month I reported the deaths of **George W. Perry** and **Percy G. Hill**. Since that time I have received newspaper clippings as follows: "George W. Perry, 84, of 48 Hillcrest Road, East Weymouth, retired president of Massachusetts Electric Co., Quincy, died yesterday at South Shore Hospital. Born in Springfield, he had lived in Weymouth since 1910. He was a graduate of Massachusetts Institute of Technology in 1905 with a degree in naval architecture. He was a retired director of the South Shore National Bank, a trustee of the board of investments of the East Weymouth Savings Bank, and a trustee of South Shore Hospital. He was also a water commissioner for Weymouth, a founder of the South Shore Country Club, Hingham, and a member of the Quincy Rotary. Husband of the late Mrs. Marian (Tufts) Perry, he is survived by a son, Edward A. Perry, and a daughter Miss Marion M. Perry, both of East Weymouth; and three grandchildren."

I had not seen George since the day we graduated. The above news is considerably more than I knew. He certainly was not a letter-writer (although I tried many ways of drawing him out) but he was without doubt a successful man.

The last time I saw **Percy Hill** was at this retirement home near Fryeburg, Maine. That was probably ten years ago. "Percy Granville Hill, 86, husband of Alice Fenton Hill of 29 Richmond Ave., died Wednesday after a long illness. . . . Mr. Hill, who had lived in the Village for 5 years, was born in Fryeburg, Me. He was a graduate of MIT, class of 1905, and had been a valuation engineer for Western Union Telegraph Co. He was a member of the American Legion for 42 years, and Fidelity Lodge, No. 113, F and AM, and YMCA. Mr. Hill also served as an Army captain during World War I. Surviving besides his wife are a son, Lyman Proctor Hill of Ocean Grove, and two grandsons, First Lt. Heath Haldane Hill, stationed with the First Special

Forces Group Airborne (Green Berets), Montagnard Country, South Vietnam, and Loring Fenton Hill of Landenburg, Pa."

The sad part of this is that I have little to report of the living. **Arthur H. Howland** has a new address, 263 Ashland Street, Holliston, Mass. **Jim Barnes** is living at 52 Chicago Boulevard, Detroit, Mich. Several letters have failed to give any information as to his present status. Perhaps some of you Course VI men can prod him a bit. A score of years ago the Wallace MacBriars were our habitual globe trotters. Recently the **Carlton Atwoods** have taken over. Carl and Anne in their last report had been on a six-week "getting acquainted" tour of Hawaii, and were planning another tour of the same length in Alaska.

Ruth and I had the pleasure of finding **Prince** and **Ethel Crowell** at our front door recently. They seemed in very good health and were the same loveable couple who entertained us with their mirth and ingenuity at several of our reunions long-ago. At dinner time Prince couldn't find his tooth, apparently something he plugs in for more comfortable eating. However, he did quite well without it. Two days later I had a letter stating that he had found it rattling around somewhere in his car. While here, he had a great joke telling of his having lost a one and one-third acre cranberry bog somewhere on Cape Cod. He found it, upon reading a relative's will, about 10 years ago, but on a revisit recently couldn't locate it again. Prince signed his letter, "The Ancient Mariner or The Third Class Seaman." While here he told of the write-up **Andy Fisher** gave me about the finish of one of Prince's most glorious yacht racing seasons. Prince had won all the big prizes during the summer and at the grand awarding of prizes, Andy was introduced as responsible for some of Prince's success because he painted his boats each spring. Andy's response was, "I hate to dim Prince's glory but his son, Sears, handled the tiller, his daughter, Olive, the sails, and Prince was just ballast."

I am having a unique experience in our little town. I have previously mentioned that my ancestors were Quakers, perhaps that several ancestors (named Hoag) were buried in the little Friends Cemetery opposite our home. Probably because of my nagging, the local Friends Association authorized me to erect, repair, clean, etc. forty or more headstones, which had fallen over a period of 150 years, not from vandalism, but from the ravages of time. Checking with the town Cemetery Book, we had to dig to find missing headstones, one under six inches of dirt, another under twelve inches and crumbled to pieces. It seems deplorable that such a condition should have been allowed to develop. At one time, about 1850, there were 700 Quakers in the town of Sandwich. By 1900 they had dwindled to three who "met twice a week, sat for an hour in silence, shook

hands in silence, and the meeting was closed." Not class news, perhaps, but this (or part of it) is just one answer to my city friends, who ask, "How do you keep busy up in the sticks?" Come up and see, and we'll put you to work on some civic project.

Your Alumni Association has instituted a service whereby the Secretaries of each class shall be notified of those freshman entering each fall who are related to a member of their class. In this way we learn that **Ralph Hadley's** grandson, Peter, entered M.I.T. in September 1968. His brother, George, graduated in 1965. Their father, Edwin, was Class of '38. Wouldn't Ralph and Grace have been happy to have known of this further distinction.

That's all! I hope I will have more news of the living for the next issue.—**Fred W. Goldthwait**, Secretary, Center Sandwich, N.H. 03227

## 06

News is meagre but Christmas is in the offing so Marion and I again wish all of you a very pleasant—perhaps even a Merry—Holiday week. We expect to be with our son and his family in Waterford, Conn. They all came up to see me during the latter part of August when I was interned at Newton-Wellesley Hospital for 12 days—nothing serious; I have been up and around since coming home.

Bertha and **Sherman Chase** enjoyed a few days outing at the Lake Placid Club (N.Y.) late in September while attending a meeting of the N.E.W.W.A. (New England Waterworks Association). On Bertha's card she said they "took two days enroute—a lovely trip—fall coloring already beginning." That fall coloring is now beautiful all over the Northeast. We often drive to one of the numerous popular eating places nearby to enjoy the color—and the lunch! In fact, we have just returned from Longfellow's Wayside Inn, taking a roundabout route home.

In 1921 I became the Class Representative on the Alumni Council and on April 29, 1968, I attended its 400th meeting. During the forty-seven years between, I have attended an average of at least five meetings a year or a total of—well plenty, and I expect to keep on awhile longer. How about you—been going places?—**Edward B. Rowe**, Secretary-Treasurer, 11 Cushing Road, Wellesley Hills, Mass. 02181

## 07

Your secretary, **Phil Walker**, was very sorry to miss the September Alumni Officers' Conference, but a trip to Boston alone did not seem to be the wise thing to do. We also do not think it wise to go for our usual September vacation to Cape Cod and will miss the calls we

have made other years on the various '07 men who live on the Cape. . . . A brief note from **Frank S. MacGregor** informed me that the family has moved to his winter residence at Tryon, N.C., 28782, Box 1384 and that this will, from now on, be his permanent address. Please correct your "Class Address List." Another change of address to note—**J. Ralph Randall, II**, from Minneapolis, Minnesota to 8200 West 68th Street, Prairie Village, Kansas, 66208.

The Review has started something new, sending secretaries a list of incoming students who have had relatives graduate from M.I.T. in the past. I have had notice that Clarence D. Howe, of 275 Buchan Road, Ottawa, is registered.

**Clarence D. Howe** of our Class was his grandfather. We should write him to meet us if at any time we hold a class dinner at the Faculty Club. . . . Our President, **Don Robbins**, is on the way back to good health again. As I write these notes he is in the Chaffee Nursing Home in Pawtucket, R.I. Don was transferred here from the Providence Hospital so that he could receive special therapy for his back. He expects to be home soon. Why not write him at his home address, and his wife Sarah will see that he receives your letter to read.

In the '07 notes in the June *Technology Review*, in speaking of **Frank S. MacGregor**, I stated that "he had given a dormitory in honor of his sister at Mt. Holyoke." This was a mistake on my part. The dormitory, "Ruth MacGregor Hall," was in memory of his sister. She was en route to France in 1918 with the Red Cross to be a telephone operator, as she spoke both French and German. She was taken ill while on board the ship, died, and was buried at sea.—**Philip B. Walker**, Secretary and Treasurer, 18 Summit Street, Whitinsville, Mass. 01588; **Gardner S. Gould**, Assistant Secretary, 409 Highland Street, Newtonville, Mass. 02160

## 09

It is with much sadness that we begin these notes by reporting the death of **John Davis**, our class Treasurer, on September 5, at the age of 81. We all remember him well both as a student and for his sociability in the drafting room at Trinity Place. He prepared for the Institute at the Rindge Technical School, was a member of the Mechanical Engineering Society, the Mandolin Club, and played on the hockey team. After graduation John entered the paper-machinery business serving with the Oxford Paper Company, Rumford, Maine; the Bryant Paper Company of Kalamazoo, Michigan; and the Becket Paper Company. He then became senior partner in the firm of Frank H. Davis Company of Cambridge until his retirement.

John was a founder of the Technical Association of the Pulp and Paper Industry and received a medallion at its 50th anniversary in 1965. For 37 years he was

clerk and historian of the North Congregational Church, and an incorporator and former Vice President and Trustee of the North Avenue Savings Bank. He took much interest in art and painting and became a charter member of the Cambridge Art Association. He was also a member of the Copley Society of Boston, the Businessmen's Art Association, the Cambridge Historical Society and the Hingham Yacht Club. Over ten years ago John was appointed to the Cambridge Water Board becoming its President, a position he held until his death. He wrote a historical article, "The Life Story of Cambridge Water," which he read before the Cambridge Historical Society.

Aside from being Treasurer of the Class, he was one of our most loyal members, seldom missing Alumni Day and class reunions, for which he did much in both the planning and carrying out. To quote from an editorial which appeared in the *Cambridge Chronicle-Sun*, "John F. Davis was a man of many talents and wide ranging interests whose roots in Cambridge were wide and deep. . . . At one point in his adult life he waged a courageous and successful battle to overcome an illness which kept him away from his business for several years. During the period of his illness he took up art as a hobby and found enjoyment in painting water colors and his own Christmas cards. John Davis was the best kind of citizen; he asked nothing for himself other than the opportunity to be useful. He will be missed not only by our city government but by countless people who were proud to know him." He is survived by his wife Margaret (Finck) Davis; two sons, Frank H., of Belmont and John F., Jr., of Philadelphia; two grandchildren, Susan and Frank; a brother, Chester P. Davis ('14); and two sisters, Mrs. Henry L. Nash, of Sarasota, Fla., and Mrs. George S. Sweet, of Arlington, Mass. The Secretary has written to Margaret expressing the sympathy of the class as well as his own, and in accordance with John's wishes we have sent a contribution to the Joslin Diabetes Foundation in the name of the Class.

A note from Margaret Davis reads: "Thank you so much for your letter of condolence and the generous contribution from the Class of 1909 to the Joslin Diabetes Foundation in memory of your classmate, John."

For the past few years the Alumni Association has held an "Alumni Officers' Conference (AOC)" early in September at which we all are guests of the Institute. This year the Conference covered such a wide range of Institute activities that the Secretary obviously can only present what he considers a few of its outstanding highlights. The prime objects of the Conference are to acquaint the alumni with the many activities of the Institute, its educational policies, plans and needs, and to keep open the lines of communication between the Institute and the alumni. Your

Secretary represented the Class at the 1968 Conference and had an opportunity to renew old acquaintances and meet with members of the faculty and other alumni.

We learned that the faculty and students are participating in such volunteer services as urban education. Although there are few black students applying for admission, special classes are planned to enable the more gifted ones to meet M.I.T. entrance requirements. President Johnson pointed out, however, that in general black students are inclined more to the social and medical sciences than to engineering. One outstanding feature of the Conference was a panel of six students, including a coed (the president of the Undergraduate Association), who discussed the operations of the Institute from the students' point of view. The principal theme of the entire meeting was the need of strong leadership in both education and public affairs.

Your Secretary also had the pleasure of meeting John I. Mattill, the editor of the *Review* who is responsible for its recent format developments; Brenda Kelley, who not only "guides" our class notes into print, but furnishes us secretaries with information and useful advice on their preparation; and Ruth King, Associate Editor. (A further description of Conference may be found on pages 108 and 9 of the October/November *Review*.)

**Elliot Q. Adams** advises us that he has moved to a new address: 17444 Trillium Drive, Chagrin Falls, Ohio 44022. **Allen Jones** reminds us that he has retired and that he and his wife (formerly Miss Helen Iredell Williams) celebrated their 55th wedding anniversary, January 14, 1968; he adds, "are looking forward to our 60th." . . . This reminds us that at the Conference Fred Lehmann, Secretary of the Alumni Association, inquired how our plans for the 60th reunion are progressing and again gave assurance that the Association is ever willing to co-operate and assist us in every way.—**Chester L. Dawes**, Secretary, Pierce Hall, Harvard University, Cambridge, Mass. 02138; **George Wallis**, Assistant Secretary, Wenham, Mass.

## 10

**Albert Huckins** was in the other day. I was delighted to see him. He told me that **Allen Curtis** had died. I have no additional information about this.

**Laurence Hemmenway** writes that he is, "still alive at 80." . . . **Harold Manson** writes from Washington: "I have just had a telephone call from Dallas that **Frank Bell** died. I thought he would outlive the entire class. His health was not too good and his eyes went back on him. Reunions will not be the same without him.

Kate and I are settled at last in our new home here. It has been very hot, but now beautiful."

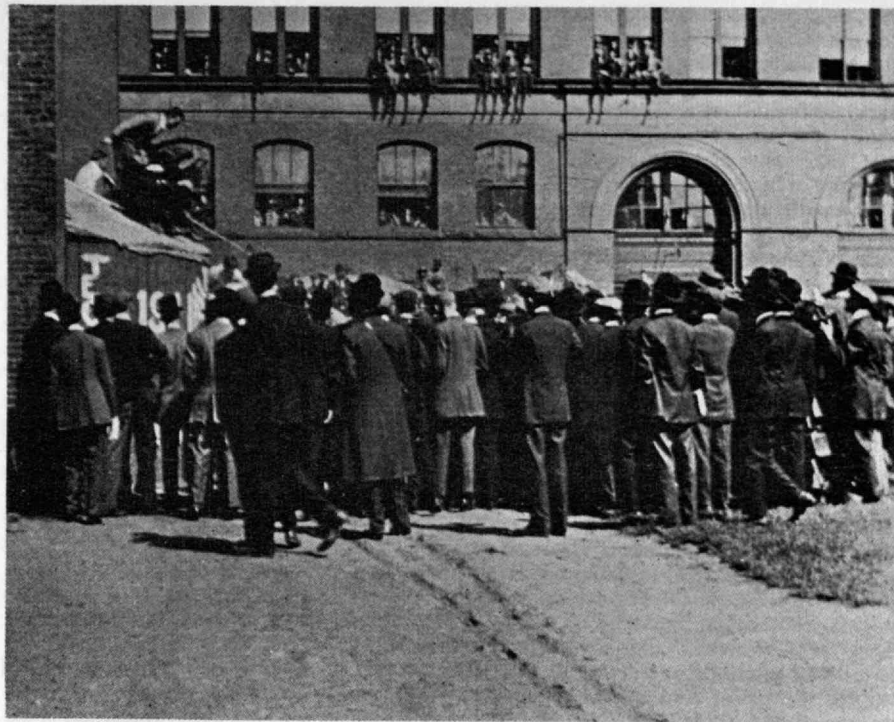


**John B. Babcock** sent the following obituary of **Frank Bell**: "Retired Brig. Gen. Frank F. Bell II, 80 of 5019 Shadywood Lane, a Dallas construction executive and engineer, died here on Monday (September 23). A native of Philadelphia, Pa., Bell had lived in Dallas the last 47 years. He was president and vice-chairman of the board of Uvalde Construction Co., board chairman of Phoenix Construction Co. and vice-president of B&B Equipment Co. of Dallas. Bell attended the William Penn Charter School, New York Military Academy and Swarthmore Prep School and was graduated from the Massachusetts Institute of Technology in 1910.

"He entered the Army in 1917 as a first lieutenant in the aviation section of the signal corps. He was promoted to captain prior to his discharge in 1919. After his discharge he went back into the reserve and became a lieutenant colonel by 1938. He was ordered into active duty again in WW II. He took the 373rd Regiment to England in 1943 and then to France where he participated in the Battle of Brest, Battle of Le Havre, and the Battle of the Ardennes. After actions in Europe, Bell was promoted to brigadier general. He was awarded the Legion of Merit, the Bronze Star, a regimental citation, and several battle stars. He was chairman of The Dallas Chamber of Commerce in 1958, and was an active member of the American Society of Civil Engineers. He was a member of the American Legion, a 32nd degree Mason and a Shriner. Bell was also associated with Sigma Alpha Epsilon fraternity. He was on the executive board of the M.I.T. club of Dallas."—**Herbert S. Cleverdon**, Secretary, 120 Tremont Street, Boston, Mass.

## 11

Last summer I had a nice long letter from President **Howard Williams**. The following is taken from it: "One of these days I will be glad to send you my biography, at the moment I am in the throes of trying to ease up a bit after all these years under pressure. There comes a time when each one of us has to slacken up and most of us in our Class are at that age right now. I shall probably keep an office with my secretary, taking care of my personal affairs and discharging my obligations on the board of directors on which I sit, as well as being a Trustee of Pitzer College (one of the Claremont group of colleges) and other situations that I seem to be involved in. I know it is difficult to "dig up" notes for the class column, and I congratulate you on the good job you have done with it. Katherine and I went to Europe again this past spring, spending some time in London, Vienna and Paris. We decided we wanted to make a motor trip through France and visit a section of the country where my daughter Anne has written a book that is being published by Random House. We were able to get the last plane from London that landed in France during the "national



A second after the gun was fired—Technique Rush, 1911. (See col. 3, '12)

strike" that took place over there during May and June. It was quite an experience landing at Le Bourget Airport in Paris where there was nobody in the control tower to guide us in, and where we had to handle our own baggage as there was not a person working in the airport. I had arranged for a car in Paris and upon arriving there—and after only two nights and a day in Paris at a time when everything had stopped completely—we took the car which I drove approximately 3,000 miles through the section of France which tourists seldom see. We were very fortunate to be able to get out of France on June 14th on the steamship France and arrived back in New York. We had many interesting experiences on this trip, some of which I will try to relate when I write you next. Recently I received a memo from Ken Brock, Director of the M.I.T. Alumni Fund, in which he gave the results of the 1968 Fund. I was glad to see that our Class had increased its percentage of participation from 64 per cent to 71 per cent and we were in second place in that category (exceeded only by the Class of 1918 with a 79 per cent figure). And that Class (1918) had a larger number of members to play with. So we can be proud of our showing, and I hope we can some time be in FIRST place."

The official printed report of the Fund passed over 1918 because it was a fifty-year Class and placed us in first place in percentage of participation. The report gives our Class 115 active members, of whom 82 contributed \$65,320. The number of contributors, the percentage of participation and the total amount contributed were higher than last year. . . . I have one new address: **Franklyn M. Stibbs**, Apartment

44D, Heritage Village, Southbury, Conn. . . . My wife, Alma, who suffered a cerebral hemorrhage last July and spent four weeks in the hospital and two in a nursing home, is now home and well on the way to complete recovery. . . . In the past few months I have talked with three classmates who reluctantly promised me material for their biographies. I'll not tell their names but hope that this reminder will get action.

**Alexander W. Yereance** died September 25 in the Northern Virginia Doctors Hospital and was buried in Arlington Cemetery. He is survived by his daughter, Mrs. Jean Zepple, and three sisters. I saw Aleck at his summer home in South Harwich last August and he appeared in good health, though he had been in the hospital earlier in the year. He was born in New York City, prepared for M.I.T. at the Orange, N.J., High School and graduated in civil engineering. His business life was with the mortgage department of the Prudential Insurance Company in their Boston office. He was a Major, retired. . . . A card from **Robert Morse**, (now living in Sandwich) on which he voted against holding a November Class Meeting, says that Boston is getting further away all the time. He was one of the five who attended last year.—**Oberlin S. Clark**, Secretary, 50 Leonard Road, North Weymouth, Mass. 02191

## 12

DO YOU REMEMBER the Technique Rush which was held each year during Junior Week? Five copies of this annual publication signed by President Maclaurin, were given free to the first five men who succeeded in presenting a ticket at the little window in a small shack erected against a brick building wall on the campus. Originally, the Rush

was held in Rogers Hall corridor, but the melee caused so much damage to the surroundings that it became necessary to transfer the event outside. I have recently read a newspaper article from the Greensburg, Pa. *Star*, dated April 10, 1911, which says: "**Archibald Eicher** (captain of our football team in 1908 and 1909), a 1912 man at Boston's exclusive Massachusetts Institute of Technology, was badly bruised and had his new clothes torn in the scramble for coveted copies of *Technique*, the Junior year book. The fight lasted 15 minutes, and Eicher was one of a dozen husky students to land a book." Our very belated compliments, Arch! We are sorry about the new suit.

**Albion Davis** underwent a serious operation in mid-September for replacement of a portion of the aorta with a synthetic section. The operation was successful and Al expects to be home about October 6. It will, however, probably be another month before he will again be in circulation. We have written Al and talked with Mrs. Davis, sending our wishes for a full and successful recovery. We are sure that he will be pleased to hear from any of his classmates. . . . News has reached us of the arrival of Stephen Bailey, the fifth grandson and tenth grandchild of **Hamilton Merrill**. Our congratulations!

At long last we have a letter from **Fred Busby** giving details of his career. Fred has been one of our most loyal alumni and I doubt whether he has missed a class reunion or many of our other gatherings since graduation. In June, 1912, he agreed to work with the New England Telephone and Telegraph Company in Boston at twelve dollars a week. After four months, during which he did almost nothing but read trade magazines and try to get acquainted with some details of the business, he decided he had had enough and took a job with a consulting engineer to learn reinforced concrete design. Business was poor, however, and the following year he accepted a position with Stone and Webster where he was assigned to work with Walter Brownell, 1910, and a staff of 25 men on the design of new Technology buildings. This job lasted for 14 months, when he was forced to seek other employment. (He had just married in June, 1914.) Fred accepted a position temporarily in a Boston high school and for the next nine years, until 1925, he alternated between teaching and engineering, partly with Stone and Webster and at Northeastern, but mostly with Charles H. Tenney & Company.

In 1925, after studying nights in accounting, he started to teach this subject at the Bentley School of Accounting in Boston, where he remained until 1941. The draft for World War II made it necessary to discontinue this course, and Fred took a job with the Navy in the Cost Inspection Department for the duration. During the next six years he taught accounting at Burdett College

when the draft for the Korean War again cause this work to cease. Through the late Professor **Erwin H. Schell**, Fred obtained a position at Tech as accountant under Mr. Paul Cusick, who is now comptroller, in which he continued until 1961 when he reached the age limit of years. There was still a lot of life in the old motor, however, so he started teaching mathematics at the Manter Hall School in Cambridge, where he is still thus occupied after eight years. Mrs. Busby passed away in December, 1960, leaving Fred alone. He says he is still in reasonably good health and expects to keep going, "as long as the old body will hold out." A remarkable goal, Fred; we are rooting for you.

**Walter Lang** writes that after receiving his master's degree in June, 1913, he studied coal tar crudes with Samuel Cabot Company, Chelsea, Mass., for about three years. He then accepted work in the American University Experiment Station for the Chemical War Service during World War I. Following this he was employed by the Texas Company at their Port Arthur refinery. After working at the M.I.T. Radiation Laboratory for about a year, he transferred to the Jackson and Moreland Company where he was a designer. He did similar work for M.I.T.'s Instrumentation Laboratory for 20 years, retiring in 1965. Walter says: "I married Bertha Ives in 1922. She was a high school friend and neighbor in Roslindale, Mass. Walter I. Lang, our son, is a '44 graduate of M.I.T. in physics and now teaches at the State College in Alfred, N.Y. He has three sons and a daughter. Our daughter, Lois, is married and has two sons and a daughter.

Bertha and I are in good health for our years and live in the same Roslindale house where I resided as a student, and to which my father moved when he came from Franklin, N.H., in 1897. He set up a small machine shop in Boston at the time in which I had part time employment through many years. It has been most interesting to me to have seen the vast changes in Beantown since 1897 for at that time our local fire engine, Boston's No. 45, was a steam fire engine with a three-horse hitch. I have been a member of the American Chemical Society since 1914, and of the American Society for Metals since 1937. It fascinates me to read about the wonderful materials and processes which have been created in my time. Please give my best wishes to the other survivors in the Class of 1912.

Here is a most unusual letter from **Bill Rhodes**, who lives in Bronxville, N.Y. He spent some 36 years with the American Telephone and Telegraph Company and the Bell Telephone Laboratories working on switchboard design. During this period he evolved a general theory of human activity which resulted in a book, *Humanology* which he says, "is now embalmed in various libraries throughout different parts of the world." We quote: "I have learned a lot. For

example, mathematical reasoning is anathema, especially to mathematicians who are at work on their own commitments. Any mention of monetary profits brands a work as commercial, and is therefore adverse to the general welfare—lower than a snake's belly. If two people get together and trade, each may profit thereby. Any acceptable medium of exchange, such as money or cows, may be introduced. Integrating this over a community of any size, and assuming that people are sufficiently intelligent to look out for their own interests, leads mathematically, to an increase in prosperity and civilization for the community involved. Historically, this has happened in various places, including the United States, up to fairly recent times, and Q.E.D., my goose hung high for a short time until it fell. The important thing is that people must be smart enough, each, on the whole, for his own interests. Now, the book out-selling all others year after year contains some such phrase as 'by their fruits ye shall know them', and by their fruits from the Vietnam slaughterhouse to the complete ruin of the most productive nation, us, the smartness of people is not at all clear, in fact not nearly as clear to me as their uneducated and dense stupidity. For example, is there not some loss when grown men loaf on relief while old ladies must struggle over heavy bags through the Grand Central station to the train? And why do we pile highway over highway and building upon building in increasing concentration of cities? This leads me to the conclusion that the field for Humanology, —'of human start and advance', in the phrase of a 1900 work on the subject, is wide open for those willing to follow along,—Russian, Chinese or Israelite, who knows? I should have written you sooner but suspect my faculties have slipped a wee bit and lethargy supplants desire."

**Fred Alden** has written a most interesting letter as follows: "I am starting this letter by telling you how very much I appreciate the efforts you and **Jay Pratt** are making to develop a good '12 column in the *Technology Review*. There is little point in detailing the different jobs I held in civil engineering for the first five years after graduation, a variety common to many Course I graduates. When World War I came in 1917 the draft board of the city of Malden poked around in the bottom of the barrel and found my name. The Army tried hard to make a soldier of me with indifferent success, and after 10 months at Camp Devens and 11 in France and Germany, I was discharged as a Second Lieutenant of Engineers.

"Soon after this I went with Metcalf and Eddy, engineers, in Boston. Although not continuously employed by them, my most effective and satisfying engineering experience was with this firm, where I was often associated with **John Raymond**, also 1912. I have always been proud to be called a 'Metcalf and Eddy man.' My retirement came in 1960. In



1927, I married Marian Ellinwood of Augusta, Me. and enjoyed forty years with the finest, sweetest, most unselfish wife and mother. We were blessed with a fine son and daughter, both now married and each having three children. Marian and I were very fortunate in being able to take many wonderful trips, both before and after my retirement, with the result that I have some 5000 colored slides of many countries, including a 65-day trip around the world in 1967. Yet I have not been to Alaska, Mexico, South America, nor most of Asia, Africa or Australia. Tragically Marian died of acute leukemia in August, 1967, after a short illness. Without a travel mate it is unlikely that I will take any more long trips.

"Along with the other surviving members of our class, I have reached and passed that period of life known as the Golden Age. My general health has averaged well over the years but I suspect that the aging process has done some unpleasant things to all of us who are now nearly eighty. In my case the Golden Age has meant a bout with shingles, the loss of some hair, some teeth, some hearing, the effective sight of one eye, a prostate gland, most of my mind, all of my virility, and with a hernia job still pending. So I, for one, hereby attest to the fact that the so-called Golden Age is not all it is cracked up to be,—not by a damn site! I shall, however, continue to live at home alone in Melrose as long as I am able to take care of myself. I try to keep physically active and intend to continue participation in church, club, Masonic and Veteran's affairs as long as possible, or until my obituary appears in print." More power to you, Fred!

We have also heard briefly in reply to letters to **George Sprowls** and to **Randall Cremer**, both promising to send in news of their activities. Randall says that he finally retired permanently in 1963, and on a round-the-world cruise stopped off at Mallorca, where he bought a winter home. He writes that the latch string is always out to any class members. The address is "Ses Voltes Blaque", Genova, Palma, Mallorca, Spain. . . . Both Jay and I took trips to New England this summer but did not get to see each other, though Jay did visit **Jim Cook** who has furnished us with several news items after contacting a few of our silent members. We shall appreciate other items from any classmates.—**Ray E. Wilson**, Secretary, 304 Park Avenue, Swarthmore, Pa. 19081; **Jay H. Pratt**, 937 Fair Oaks Avenue, Oak Park, Ill. 60302

LATE NOTE: Hard luck still seems to be following **Jim Cook**. You will recall his serious auto accident in 1965 which followed a fall and broken right hip the year before. A note received from Jim on October 12, says: "I am in the Salem Hospital with a right hip broken in an unexpected fall last week. Have it pinned. Am in cramped quarters (probably due to overcrowded conditions)." Our sincere sympathy, Jim! Looks

like you got it twice in the same place. May you have a most satisfactory recovery!

## 13

Again, we must mention the very successful 55th reunion at Connamessett Inn in June, 1968. We participants were and are greatly indebted to **Heinie Glidden** for the beautiful slide show of a most colorful and interesting tour of Western British Columbia and coastal California. **Clarence Brett** and **Robert Tullar** also supplied us with slides showing some of our classmates at our 45th and 50th reunions at the Oyster Harbor Club (destroyed this past spring by fire and wreckers).

We are pleased to have received so many letters from certain buddies who could not join us at the 55th. **Phil Burt** writes from Yarmouth, Mass.: "I am not sure yet but hope to get over to the banquet Saturday night." . . . **Gordon Howie** states that his dear wife, Ethel, has been in the hospital several times lately, so the Howies could not join our classmates at the 55th. We all hope that Ethel is back again in her usual good health; we missed her sunny smiles. . . . **Johnny Welch** had planned to be with us at Falmouth, but since just returning from Florida, changed their plans and did not reunite with us. . . . **Sam Rogers** wrote to Bill Brewster that due to the ill health of his wife, Peg's arthritis etc., the Rogers could not join us this year. . . . **Clarence Brett** informed us that because his charming wife is another of us who suffer from that ailment, that the Bretts would be among the missing. We all hope that Ruth will outgrow her discomfort and will join us at our next reunion (1970 or 1973).

**Frank Achard** and his wife, Flossie, were unable to make Connamessett as Frank has had several illnesses since last Xmas, including a slight coronary. We have talked to the Achards several times on the phone and believe that Frank will soon be able to hold up his end of a tug-o-war. . . . **David Stern** reports: "Thank you for sending the reunion reminder. Regretfully, we can't make it this time." It was noted that Dave frequently supervises most of the social events of his Temple. . . . **Leon Parsons** wrote that he and Polly would be unable to reunite: "We had hoped to be with the good 13ers, but again I find it impossible with the work here at the Academy." . . . **Charles Wood** stated that he had just returned from the hospital and would be unable to attend the reunion.

**David Nason** informs us at length that for numerous reasons he and his nice wife would not journey East until September. He further related that in late June, also August, he would journey to Northern Canada for those big "fish." In December the Nasons will sojourn to the West Indies and, of course, he is worried about the health, wealth and sanity of the

world in general. Keep us posted on your theories and fishing conquests, Dave. . . . Fred Lane and his wife, Eva, although they had expected to join us at Falmouth, were unable to, due to unexpected illness in their immediate family.

It was decided that a class picture would not be taken, and "so be it." . . . **Raymond Haynes** phoned that he could not join us at Connamessett but would take a plane for Alumni Day. (He was true to his word.) . . . **Robert Tullar** and Beulah were sorry not to be able to make the 55th as Bob was involved in his borough's 75th anniversary in Lansdowne, Pa. Thanks again for the slides of the 45th and 50th reunions. . . . **Paul Cogan** says that it is impossible for him and his wife, Arlyle, to meet us on the Cape this year. . . . We were very much saddened to hear from **Gardner Alden** that his dear wife, Alice, had passed away after 53 years of a wonderful married life. The Class of 1913 extend to you, Gardner, our heartfelt sympathy for your great loss. . . . **John F. Foley** writes: "I am retired after 37 years with the Proctor and Gamble Company. Am living in New York City and spend the winter months in Florida. Saw **Bill Mattson** in May 1967, at the 50th reunion of E Company, 101st Engineers. He looked fine and we had a good time together."

At the Alumni Day dinner, the Capens sat at the table with the Class of 1912. Among the group were Mr. and Mrs. Cyrus Springall, '12. . . . We have received a very friendly note advising that our old roommate **John Lincoln Barry** is now living in Cohasset. We tried several times during the summer to phone John without success. Thank you Marjorie Springall; we shall try to contact John in the near future. . . . **Herbert Shaw** has written a very newsy letter as usual and also one of thanks (for the advice regarding cataracts.) Again, Herb, those color snapshots of our 55th are very good. . . . A card of appreciation has been received from Edith Horner.

The Capens were the guests of the 1968 National M.I.T. Alumni Officers' Conference, held in Cambridge, September 6 and 7. This conference of the M.I.T. class officers was the most successful of any ever held (your Secretary has attended every conference since the early 1950's, except the one held in San Francisco). The text of the conference entitled "Changing Goals and Priorities in the Development of Leadership" was well conceived and appropriate at this time of national disturbances among youths. All of you should be very proud of the leadership of Dr. Killian and President Johnson as well as the co-operation of the Faculty and the Alumni Association. Having the girls and wives invited to attend all of the festivities added to their understanding of affairs at M.I.T. It is noted that the Class of 1913 made a record contribution to the 1968 Alumni Fund. It topped all of the classes celebrating their regular five-

year reunions with the exception of the Class of 1943 (25th); Class of 1928 (40th); and Class of 1918 (50th). The tally for '13 is 66 per cent of the Class contributing a total of \$72,853.00. . . . Members of '13 and other classes at M.I.T. who have enjoyed the hospitality of the Coonamessett Inn may be interested to know that several groups of business men have been negotiating for this wonderful inn. It is rumored that an offer of \$750,000.00 has been made. . . . Until 1969, Sincerely—**George P. Capen**, Secretary and Treasurer, 60 Everett Street, Canton, Mass. 02021

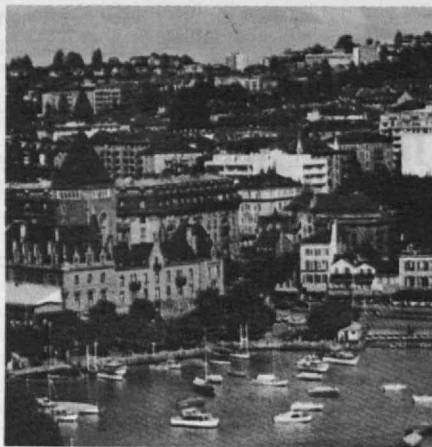
## 14

A few more potential attendees to our 55th Reunion next year have reported. **Ted Gazarian** writes: "Dear Les, Sorry I haven't returned this form before this. I suppose it doesn't help much now.

As you will note from this address we have somehow landed in Southern California after living in Daytona Beach, Fla., on and off during the last five years, and will be residing at Mission Bay section of San Diego 'till next summer. In the meantime we are looking forward to the pleasure of attending our 55th reunion if at all possible. Mrs. G. (Vi) joins me in sending to you and to all members of our Class most kind regards. H. Ted Gazarian."

We hadn't heard from **Frank Atwood** for some time, he writes: "Dear Herman: I must have been swamped this summer for I just ran across the June issue of the *Review*. It was fine to read so much news of the Class. I envy all those who tell about how they retired. We thought we were going to take it easy here in one of the finest retirement towns in the country and also do a little traveling. However, as you know, my wife loves to build houses and decorate them so we acquired a good sized acreage in an area that nobody else wanted and started out gradually. Now it has grown like Topsy and we are tied up more than we ever were. Last winter our attorney, who would inherit most of our problems if and when anything happened to us, decided it was time he learned a bit about our business and advised us to sell out. That's our status now, but with interest rates where they are it may take a little time to find a good buyer, so I am manager since we have no sons and our daughters are scattered.

Yesterday we saw one of our daughters off to Nigeria. Her husband got his masters degree at M.I.T. and worked on the Faculty House until called to the University of Oregon. There he had many African students so on his first sabbatical he went to Ghana and acted as architect for Kaiser Engineers for two years. He has been head of his department at Oregon. Last year he studied the several African universities for two months on a Ford Foundation grant. This year the Nigerian government asked him there to be a visiting professor.



Geneva, Switzerland

As for ourselves we meet a great many interesting guests. Some have become good friends. (Right now I hear our Canadian geese friends coming back for the winter.) Recently we took a few days off to spend some time for our 50th wedding anniversary breakfast on top of Greylock. I doubt if we will get up your way but hope you can visit us here sometimes. Regards to you and your wife. Frank Atwood."

The wandering **Alden Waitt** is at it again. On an army postal service card from Heidelberg, Germany, dated Sept. 6, 1968, he says: "This is the first summer in several years that I haven't spent some time in New England and I miss the home country. This year, with a daughter in Heidelberg and son at Illesheim, Germany was inevitable. Hope all goes well with you and yours. Best wishes, Alden."

A note from **Harold Richmond** also passes along some information about the Bob Townends: "Dear Herman, **Bob Townend** and his wife Maude dropped in this afternoon for a short visit. They were at the M.I.T. conference. I had been at Cape Cod for a three day visit where I had spent one evening with Hugh Ferguson, '23, who gave us quite a showing of the sand dunes of that weird end of Cape Cod.

Here is a card from the **Bob Townends**. They had had a fine two months trip on the British Isles off Coventry. Bob looks fine as ever. Write him for details. They had also stayed in a hotel about the center of this card. Bob had not heard of the death of **Charlie Fiske**. Bob's card, dated May 29, 1968, from Lucern reads: "Greetings from Switzerland. Maude and I are taking a sort of celebration holiday here on account of our 52nd wedding anniversary. We have just returned here from a few days in Vienna and Austria.

The scenery has been marvelous and we have been lucky with the weather. Glad we are not in France at present. We spent two nights in Paris on the way here when everything was normal. Regards from us both. Maude and Bob Townend." And a card from Geneva to your secretary in June says they are

sailing home on the Bremen after a trip through Lausanne.

We have on hand a copy of the Middlebury College *News Letter* of the past summer. A large portion is devoted to the important part **Bert Hadley** has played in the history and development of Middlebury which he attended before joining '14. He is pictured with five members receiving Honorary Degree Citations, an inspiring testimony to his achievements as 1968 marks his 24th year as Chairman of the Board.—**Herman A. Affel**, Secretary, Rome, P.O. RFD 2, Oakland, Maine 04963

## 15

The Class Supreme exemplifies with its fine spirit that "there is something different about college classmates," a theme so well amplified by the late Maggie Magoun, 1918 Secretary in his June notes. Fran and I have had a gay summer with enjoyable visits to New England classmates and their families and I've had many interesting lunches and visits with our men around metropolitan Boston. These are old and close friendships that seem to mellow with the years. While holidaying in Vermont, we had a delightful lunch and afternoon with Helen and **Boots Malone** at Woodstock. Both were in good health and spirits. Later we spent an evening with Elizabeth and Doug Baker at East Middlebury. Doug is continuing his cobalt therapy and seems to be doing all right. They have sold their big farm out in the countryside to move into a ranch type house nearer the village.

At Quincy, N.H., near Rumney, we spent an afternoon with Helen and **Phil Alger**. Since his last surgery, Phil has been given a clean bill of health and is as active as ever. Then we went on to stay a few days as **Wayne Bradley's** guests at his Moosilauke Inn, Warren, N.H. Many thanks Wayne, for your kind and generous hospitality. We recommend this resort to anyone who wants to go up into the rugged and spectacular scenery of the White Mountains. Later we landed at **Ben Neal's** place on Cushing's Island in Casco Bay at Portland, Maine. Here Ben and his charming daughter, Barbara, who was with him at our Fiftieth, gave us the real red carpet treatment. A fine summer with fine old friends.

**Phil Alger** writes—"I went down to Boston on September 6 for a final check by two doctors, and they both said I am all cured—come back next year. I asked them to give me some elixir of youth—one declined, but the other said he has put in an order for some, and may give me some if I come back next year." What an ambition he has!

Now, from this burst of poetry you can see that **Lucius Bigelow** has diversified talents, aside from his outstanding scientific achievements:

"To 1915, The Class Supreme  
Priceless good vision I do lack,



Teaching "for free" draws not much pack,  
Paid consultation's in the sack;  
But don't tell me the prospect's black,  
For many things I have some knack,  
With these, and home, I'm right on track.  
Our best to all with Azel Mack!"

In their invitation to us to visit them, Elizabeth and **Doug Baker** wrote: "We are delighted to learn from your letter that your health is sufficiently good so that you can make a trip around the north country this summer. I have been intending to write to you anyway but have been waiting until our own plans were more definite. The news from this 1915 outpost is that we are selling our place and moving from the farm to a small new home in East Middlebury. It is no longer possible to take care of the chores around our farm house to say nothing of improvement projects. Moreover, in June I was again at Mary Hitchcock Memorial Hospital in Hanover, N.H., and it is quite likely that there will be recurring incidents in the future. We are looking forward to hearing from you and, hopefully, to seeing you."

While in Providence, I missed a chance to see **John Dalton** but talked with him. He is quietly retired, enjoying bridge and golf. . . . From Bloomington, Calif., **Ray Gladding** writes that he is Secretary of E. F. Gladding Co., is still at work building schools out there and is in good health. . . . Sampson Sun Mar, grandson of our deceased classmate, Admiral **Pellian T. Mar** of Taiwan, is a freshman at Rensselaer Polytechnic Institute, Troy, N.Y. His father, Gilbert B. Mar, 1951, called me and hopes the boy finally goes over to M.I.T. to make a third generation alumnus in their family. Good luck to young Sampson. . . .

From Martha's Vineyard, **Charlie Norton** writes: "As for me, my productive capacity always dropped off at least 50 per cent in very hot weather. Now I've got to the point where I'm just plain lazy." It's taken Charlie a long time to reach the point where, I think, a number of us have been for some time. He doesn't do himself credit, though, for he's a very energetic and busy guy.

Ernie Loveland wrote a long letter from Zamboanga City in the Philippines, which I'll have to excerpt for next month's column. In my archives I found a picture postal of Paris, mailed October 8, 1944, from an A.P.O. address by Colonel **Jim Tobey**: "I have been in France several weeks and have arranged to see something of the world's most beautiful city, as well as some of the combat area. Regards to all 1915 men." There's a nostalgic touch for you. . . . In the Peterboro (N.H.) *Transcript* of July 18, is a good picture of our Pop Wood shaking hands with Walter Peterson who, **Jack Dalton** writes, will, hopefully, be the next Governor of New Hampshire. Pop is active and prominent in their Civilian Defense up there. . . . On October 18 we are having a Class dinner



Crowd at the kite party

at the M.I.T. Faculty Club, report of which will be in the January 1969 column.

More nostalgia from some ads in that old 1915 Tech Show Program I quoted from last month. There were four daily Boston to New York trains on the Boston and Albany Rail Road which stopped at Trinity Place. Today, there is no Trinity Place and there are no trains. . . . Scott & Co., Limited, Washington Street, had students suits (with vests) at \$25., "tan or black calf oxford shoes for men" at \$5.00 to \$7.50 per pair. Lombardy Inn (remember it in the alley off Boylston Street in back of the Colonial Theatre) served "table d'hôte" dinners at \$1.00 each with a special Sunday dinner at \$1.25. Hotel Napoli, way down town at Friend and Washington Streets had table d'hôte lunch at 50 cents; dinner at 75 cents and "special daily combinations at 45 cents." Hotel rooms at The Thorndike—"With bath \$2.00 to \$5.00 for one person: \$2.50 to \$6.00 for two persons." Hotel Somerset—"for one person with bath \$2.50-\$4.50 per day; for two persons with bath \$3-\$5 per day." Ah me! Those were the days. Ruthie Place, now Mrs. Leo J. Hickey was in Boston in the Fall, visiting their many old friends. Some of us had a chance to see them for a pleasant evening. They are both doing fine and Ruthie sends regards to all her 1915 friends. . . . **Archie Morrison** and **Al Sampson** had a chance to see **Joe Livermore** while he was here in the summer. . . . It is sad to report the passing of **Allen Abrams** who died August 9 in Wassau, Wisconsin. The sympathy of our Class goes out to his widow and family.—**Azel W. Mack**, Secretary, 100 Memorial Drive, Cambridge, Mass. 02142

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"You win a few and lose a few," to quote a local radio announcer—that's the way it used to be, that's the way it still is and that's the way it's probably going to be when you play golf at reunions. And now, says our lively president, **Ralph Fletcher**, we are to look forward to our 53rd next June at Chatham Bars Inn on the Cape. Looking backward to the 52nd, the **Phil Bakers** were not there

for they were combining one of his birthdays with a big kite party (some 400) by his daughter on the reunion weekend. As Phil says, "a host of good friends and their children meet at the country club and fly kites, eat hot dogs, drink beer and pop—it makes quite a party." On another subject he adds: "The more I have seen of our different classmates, the more I am impressed. They indeed make up a remarkable group and your class notes keep us posted on the varied activities. M.I.T. is growing beyond recognition but all colleges and universities are growing unbelievably. All cities and countries are likewise growing and we stand aghast at this phenomenon taking place all about us. One could philosophize no end about it and be out of date tomorrow."

The **Barnett Gordons** missed the reunion for Barney had a commitment to attend the Brandeis commencement festivities that weekend, and as Ruth wrote: "Since he is a Fellow of the University, he really must be there." We were sorry to have word from **Allen Giles** that the sudden death of his wife from a heart attack would prevent attendance. Our sympathies to Allen!

The **Dave Pattens'** absence is thus explained by Dave: "As for this year's reunion, we had it scheduled but that weekend my daughter-in-law staged a coming-out party, a grandson graduated from Kent School *cum laude*, so with his parents in Thailand the grandparents were pinch-hitting, and one can't be everywhere even in this jet age. So far it's been a hectic season and bids fair to so continue. In fact, the uncertainty of events, personally, monetarily, politically and economically have the analysts guessing—like the six blind men in their understanding of the elephant. And Ted Kennedy favors the elephant to win, so where does that lead us? 'Peanuts' may have a clue." Later, after going through another birthday, Dave noted: "I kick less and dream more, at this marvelous age, leaving the former to the young, defiled. However, at the family Maine camp last month I paddled some five hours in each of two days, seeing moose, deer and beaver, that symbol of M.I.T. Now back to the boondocks rooting for Nixon."

In May **Willard Brown** wrote Ralph: "I just can't make it this year principally because my daughter, Eleanor, her husband and their two teen-age daughters are coming out here in June and we have to take them to Disneyland and other places (Disneyland in some style, because J. Sam Hamel, best man at our wedding a year ago March is, in addition to running his consulting engineering firm, chief engineer of Disneyland, and that results in passes). And I have an almost vast number of commitments here, some civic, some personal and some lighting. So, my very best to you all—I will certainly miss not being in the welcoming party for you and Sibyl at the Hyannis Airport!!"

Greatly missed too were **Emory** and Ruth **Kemp** of Sarasota, who rarely miss a reunion. They planned to attend the wedding of their very-close granddaughter, Stephanie, on September 7, and their good old family doctor just said, "No." to two driving trips to New England. Emory says that following last year's attendance at our 51st, his doctor raised loud objections to his 490-miles-per-day average of driving and insisted that the next trip to the Cape was to take four days up and four days back, at least five weeks apart. Emory, who is still here because he obeys rules, says he'll surely be back for the 53rd. **Cy** and Gypsy **Guething**, who couldn't make the reunion this year, nevertheless got down on the Cape, at Coonamessett late in June, then went on to Boothbay Harbor on July 2. "There," says Cy, "it is as heavenly as ever with a swim and a walk each morning before breakfast."

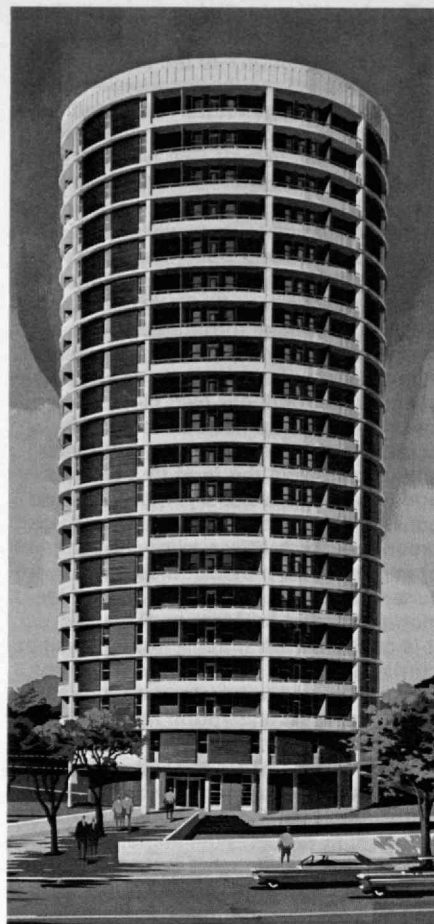
**Charlie Cellarius** and **Irv McDaniel** have both come through with some remarkably fine pictures taken at the reunion in June, so good, in fact, they have both been in the negative-loaning business during the summer months. Following the reunion, Irv and Kay did some sight-seeing traveling and we have been able to get a copy of parts of their story. First some notes on Acadia National Park, Maine: "'This is the forest primeval, the murmuring pines and the hemlocks. . . . This is a small but lovely National Park. Plan to spend at least a day there if you are ever near that place. The Coastal Vistas are delightful and then from the top of Mt. Cadillac you get some marvelous panoramas. Longfellow made the Acadians famous with his poem about Evangeline. He states in several places that they came from Normandy, France. . . . 'such as the peasants of Normandy' . . . 'wearing her Norman cap' . . . 'sang in their Norman orchards' . . . etc. I do not wish to argue with Longfellow and he was probably right but I have a hunch that they were originally from Brittany. Newcomers name their towns and cities after the places they come from and so many of the towns of Maine, Nova Scotia and New Brunswick are named after towns in Brittany that we loved; I found none that were named after towns in Normandy. So I decided to ask some of the natives where the original Acadians came from. One answered: 'Never heard of them.' Another replied: 'I have only lived here a few years.' And another: 'I'm a stranger the same as you.' So: 'In the heart of the city, they lie unknown and unnoticed, Daily the tides of life go ebbing and flowing, Still stands the forest primeval.'"

Later on, Irv writes briefly about the far West: "In Salt Lake City we heard the Tabernacle Choir on Sunday morning and Kay saw the great Salt Lake for the first time. Due to irrigation projects the lake is rapidly drying up. The shore line is retreating faster than we are in Saigon. In Las Vegas we saw all the girl shows. I get tired of looking at

girls, especially after waiting for Kay at our local market. They don't care how undressed they are these days. But at the girl shows they had some wonderful horses and trained bears—these I liked. I also won enough to almost pay our expenses. We finally arrived home—as we pulled into our garage, the left rear tire went flat."

Talk about busy! **Izzy Richmond** is your man! Back in May and June there were two big illustrated newspaper articles about forward-looking architectural designs called "new" and "revolutionary." And the architects? You guessed it—Boston architects Isidor Richmond and Carney Goldberg, '28. The first article relates to a "New Design for the Elderly" as reported in the May 15 issue of the *Sunday Herald Traveler*: "Housing for the elderly, which has had a history of failure throughout the country, will be tried again in Roxbury soon—this time utilizing a unique design approach. Probably no type of shelter has drawn so much criticism as the dwelling units built to solve one of society's greatest human needs. But a team of Boston architects commissioned to design a low-rent development at Walnut Park and Columbus Avenue believes they have eliminated the popular approbation 'concrete jungle' and have provided the characteristics of graciousness and charm oldsters deserve." Research by the architects brought out that "the elderly do not like to feel they are surrounded only by their contemporaries. This observation has been supported in many centers throughout the country, and in several cases brought the development to failure. . . . From their studies Richmond and Jacobson conceived a 20-story circular tower with only nine dwelling units on each floor. Surrounding this core is a circular corridor giving access to each living unit. Because of the curve, only two other entrance doorways may be seen. Thus, the long dismal corridor of the typical projects is eliminated." The captions under the two impressive illustrations of the circular building read: "A feeling of belonging, generally the missing ingredient in housing for the elderly, was a design objective for the Walnut Park, Roxbury development designed by Boston Architects Isidor Richmond and Carney Goldberg. . . ." and "The floor plan shows how each living unit fans outward providing a sense of size and a balcony with a wide angle view, space for porch furniture and privacy. The \$3 million project is being bid with completion scheduled early in 1969." The second article relates to "Boston's Revolutionary New Schools," reported in the June 2 *Sunday Herald Traveler*, and covers new elementary schools for the Roxbury-Dorchester area; this will be highlighted in our next issue.

Once more, talk about busy! This time **Vert Young** of Bogalusa, La., is your man! He has been made chairman of a drive to raise \$750,000, launched by the board of directors to meet the capital



*Housing for the elderly at Walnut Park and Columbus Avenue (Roxbury District), Boston; designed for the Boston Housing Authority by Isadore Richmond, '16, and Carney Goldberg, '28.*

needs of G.S.R.I. (Gulf South Research Institute). As a matter of fact, Vert is Honorary Chairman of the Board of G.S.R.I. which was established in 1966 as an "independent, not-for-profit, grant and contract corporation owned and governed by a Council of Trustees comprised of 18 of Louisiana's College presidents and 97 other leading citizens of Louisiana." As noted in the August issue of the *G.S.R.I. Reporter*: "GSRI represents a pioneer attempt to provide broad-scaled research in Louisiana to meet the growing needs of industry, government, and the general public for such services. Although G.S.R.I.'s primary concern is Louisiana, it is geared to serve the Gulf region. It is organized to perform studies in economics and management, urban development, the physical sciences, life sciences, and engineering research. It has 14 divisions located in New Orleans, Baton Rouge, and New Iberia, La., to facilitate collaboration with universities in those areas. The Institute is headed by a 15-man board of directors elected by the council of trustees. Tulane University, Louisiana State University, the state colleges, and independent colleges must be represented on the board." As you may recall from news items in our past class columns, Vert has made many contributions to the development of



Louisiana since the late 1930's, including one thing we can never forget—responsibility for planting 150 million pine trees in the state! And Sylvia and Vert still say—if you get to New Orleans or in that general area, give them a telephone call and let them arrange for a little visit to their plantation in Bogalusa.

**George Petit** with his expertise in statistical trend analysis is still actively and boldly interpreting trends for useful purposes. For example, we have had this note from George: "Received a nice tribute from the Detroit Tigers of the American League to whom I sent numerous graphs of their progress based on probability theory in August, indicating winning the pennant by 101 to 103 games with a most probable 102, allowing for the 'standard error of the estimate', or less than one 'standard deviation.' Kind regards to all our remaining classmates, the last thin line of a great class, 1916."

We are very sorry to report the death of **Paul Hatch** of Dover, Mass., on May 4th. We have been able to get a number of interesting details of Paul's life through the kindness of his son, Paul W. Hatch, of South Duxbury, who has furnished us with a short write-up prepared for the Hatch Genealogical Society. After graduation Paul stayed over for a year of teaching at Tech. In 1917 he was commissioned 2nd Lieutenant in the Coast Artillery Corps with basic training at Fort Monroe, Va., and shipment to France in September 1918 where he served briefly. He married Eleanor Phillips in 1923 and settled in Wellesley Hills.

Building things, particularly boats, soon became a major avocation and over the years he "was to turn out no less than ten boats—two sailboats and eight skiffs. The largest of these, a 17-foot catboat, was built in 1930 and was still in the family at the time of his death." During the decade 1926-1936, the family summered at North Falmouth but in 1937 he "bought 'The Hatchway', a magnificent summer home situated on a bluff in Cataumet and looking down the full length of Buzzards Bay. It was here for over a quarter of a century that countless friends of the family came to enjoy a Cape Cod weekend of sun, sailing and warm water swimming. It was here too that he won an unchallenged reputation for hosting the finest lobster and clam chowder dinners."

At age 32, Paul became General Manager of the New Hampshire Power Co., and after several years spent in turning the company into a profitable venture, he became President. However, in 1936 outside interests took over his company and by 1939 he had left. From then on his efforts were largely confined to electrical engineering work for several of the better-known Boston engineering firms of the day. Notable among these were Stone & Webster Engineering Corporation, Chas. T. Main, Inc., and Jackson & Moreland.

We are also sorry to hear from Ezra Stevens, '27, that his brother-in-law and our classmate, **Stanley Barker** of Kensington, Md., died on August 2nd. He was a retired civil engineer for the U.S. Navy and died in his summer home in Stoneham, Maine. He was born in Red Deer, Alberta, received his bachelor of science degree from Harvard in 1915 and did graduate work in sanitary engineering there and at M.I.T.

As reported in the *Washington Post* he "served in the Navy in both world wars and retired as a captain. In 1946, he received a citation from the Secretary of the Navy James V. Forrestal for his service in the Navy. From 1950 to 1955, Mr. Barker was assistant director of the bureau of environmental sanitation for the New York State Department of Health. From 1955 to 1960, he worked for the Navy as an engineer in Spain. He served the Navy as a sanitation engineer in Bangkok from 1960 until his retirement in 1965. Mr. Barker was a fellow in the American Society of Civil Engineers and a Diplomate in the American Academy of Sanitary Engineers. He leaves his wife, the former Elizabeth Jones; a son, Lester, of 9918 Old Spring Rd., Kensington; a daughter, Mrs. Albert Vinal, Jr., of South Duxbury, Mass., and six grand children."

We continue to collect records of '16 history—just listen to this from **Paul Page Austin**: "Recently, in going through a lot of old papers that I have accumulated over the years and throwing most of them away, I came across a lot of newspaper clippings regarding our graduation exercises, and the dedication of the new Tech buildings. They are brown with age but I didn't quite have the heart to throw them away. I will mail them to you—if you throw them away after looking over them, that will be fine with me. I simply feel that more than one class member should see them before they are consigned to the 'round file cabinet' (or 'circular file'). Things are still the same with me—still working 40 hours a week."

This ancient material will be shown at the reunion next June and each of you will have a chance to see again in print that you were a Byzantine (like we were!), a Carolingian, a crusader or what. It is interesting to be reminded that Steve Brophy was "Student Director of the Pageant," and to see again the names of some of the '16 Leaders of Historic Groups: Kephren, T. C. Jewett; Phidias, C. T. Guething; Augustus Caesar, H. R. Crowell; and Christopher Columbus, C. A. Coleman. And referring back to the wonderful pictures of the 1916 dedication, furnished by **Bob Diemer**, we have this word from Bob: "We old timers sometimes tend to live in the past, perhaps more than we'll admit, and I'd prefer to remember Boston as it was in our undergraduate days rather than see it as it is now. Yes, I will remember 'Day's Hair Lunch' and the many plates of

beans I destroyed there. 'Em were the days!'"

We missed **Nat** and Martha **Warshaw** at the 52nd. Nat continues active in his specialty of "materials handling," using as a principal business rule, "I'll go anywhere if I can be back home that evening." He notes: "Just read an excellent article on cigarette smoking, which should make all of us proud of **Dick Berger** and his foresight on cancer prevention." Then he reminisces: "Do you remember at one reunion we all discussed what our class could do to leave its mark? If we had selected a class project to sponsor, perhaps there would be fewer 'hippies' around. They are simply un-motivated youngsters in this fast-moving world. Just think how much better off the world would be today if collectively we had followed Dick Berger's direction. To his dictum that 'It is stupid to smoke' we might have added 'It is stupid to drive after drinking' or 'It is stupid to over-eat and under-exercise.' I don't know when I became so philosophical." But Nat practices what he preaches—he is still a quarter- or half-mile swimmer, and does a lot of walking and exercising.

**Freeman Clarkson** of Newfane, Vt., sends us what he calls a "brief synopsis of life" that he feels may not be too interesting. But we really found it so. He joined us at Tech after graduating from Williams (B.A. 1914), and following his two years with us (M.I.T. S.B. '16, and Harvard S.B.E.E. '16) he became Captain, Corps of Engineers, 1917-1920, with three years overseas. Then he was with Western Electric and Federated Engineers until 1925, with Industrial Sales Engineering Company up to 1935, a self-employed manufacturers' representative and with Putney School until 1943. He says he then retired for reasons of health and became a gentleman farmer and reforester. His son is Coordinator of Math, Ulster County, N.Y., his son-in-law is a Senior Staff Engineer at Hughes Aircraft and there are six grandchildren. As for living space, he says: "I've visited every one of the 48 contiguous states and find Vermont is the super one! Come and see."

The **Francis Sterns** tell of a long July weekend in Cleveland where they attended a big party given by close friend Edgar Weil, '13. Then says Francis: "Aside from the party, we heard two beautiful concerts at the new Blossom Festival. I am assuming you know that there has been a beautiful outdoor shell built halfway between Cleveland and Akron, to become the summer home of the Cleveland Symphony as is Tanglewood for the Boston Symphony. We heard the symphony for both the Saturday and Sunday concerts. Acoustically the shell is unbelievably good and most comfortable in the way of seating arrangements. The shell seats 4,642 and the lawn, as the shell is built at the bottom of a type of valley forming an amphitheatre, seats another 8,000 to 10,000 on the grass.

Francis tells of taking along his '16 geographic register to make contacts with classmates. He found **Herb Ellis** had moved (now in his new apartment 3381 South Leisure World Boulevard, Silver Spring, Md.), **Al Simmons** was out of town but **Ralph Spengler** was at home in Wade Park Manor and exchanged reminiscences.

A number of items for the column reach us through **Jim Evans**, of Fair Lawn, N.J., who continues handy with the pen in addition to sending out the notices for the monthly class luncheons at the Chemists' Club, 52 East 41 Street, New York. By the way, the September 5 joint luncheon of '16-'17 included **Art Caldwell**, **Jim Evans**, **Rudi Gruber** and **Harold Dodge**; **Enos Curtin**, **Dick Loengard** and **Dix Proctor**, of '17; plus a welcome guest, **Clarence M. Joyce**, of '03. The schedule ahead for '16 luncheons is the Tuesday following the first Monday of each month, at noon.

**Hovey Freeman** writes Jim that he didn't feel up to the reunion this year: "Feeling better and stronger but get tired easily. Keep busy reading, working for short periods in my hobby shop and fixing things around the place. No office any more, go to town about once a week for directors meetings and that's about it." **Stewart Keith** of Denver tells Jim of a thirty-day trip East to Washington and to Cape Cod, visiting five families, concluding with, "Expect it will take us a month to rest up."

A little note from **Charlie Crosier** of Rocky Hill, Conn., says: "Our travels so far this year have been limited to a trip to Bermuda in March. Community and church activities continue to keep us busy." And from **L. Waring Wilson** of Allendale, S.C., comes this encouraging message: "Just got home. Was in hospital from December 1966 to date, so I am 'retired.' Unconscious until July 1967. Some trip! Glad to hear from **George Petit** '16."

Finally, we'll look forward to our 53rd next June. As **Willard Brown** wrote last June: "How we are shrinking! I have in mind particularly **Len** and **Ruth Best**. I sat with them at our 50th banquet at Oyster Harbors Club, and now Len is gone and that venerable institution is gone too. We simply must stick together during the coming years—I intend to be on hand for our 53rd if I am ambulatory, as I certainly am now."

We have further letters and news from **Barney Gordon**, **Charlie Lawrance**, **Herb Mendelson**, **Frederick Upton**, **Irv McDaniel**, and **Kem Dean** which will be reported in the next issue. So, now again, to help us keep the little old column full and interesting, write a little but write often to **Ralph**, **Joe**, **Francis** or one of your secretaries.—**Harold F. Dodge**, Secretary, 96 Briarcliff Road., Mountain Lakes, N.J. 07046; **Leonard Stone**, Assistant Secretary, 34-16 85th Street, Jackson Heights, N.Y. 11372

# 17

Seasons Greetings to you one and all including the *Review* staff with welcome to Miss **Brenda Kelley**, Alumni News Editor.

The National Alumni Officers' Conference held in September was attended by almost 500 alumni and staff including our **Kenneth E. Bell**, **A. Raymond Brooks**, **William L. Dennen**, **Stanley C. Dunning**, **John A. Lunn**, **Raymond Stevens**, **Winthrop C. Swain**, **Dustin W. Wilson** and **C. Dix Proctor**. Seven of these were accompanied by their wives which was an innovation at this conference. **Dusty** and his wife will not be attending the 51st Reunion as they are touring the Orient—Japan, Hong Kong, Singapore, Bangkok, etc. and sent their best wishes for a good gathering at Sturbridge, Mass.

Last year the Boston *Globe* published an article entitled "He Linberghed Pacific in 1927." Our **Albert F. Hegenberger** was the navigator. "We did not always know where we were, but we didn't get lost," so states the pilot, Army Lieutenant **Lester J. Maitland**. "The plane was a tri-motor Fokker with a maximum 600 horse power. Because of the heavy gasoline load the plane's three motors were an absolute necessity to keep it in the air until it was well past the halfway point, or the point of no return. To lighten the load parachutes were left behind. During the nighttime hours of the 25 hour 49 minute flight, a flash light was used in reading instruments and in inspecting the motors. Their only communication with the ships at sea was a battery radio that did not work when needed. We tried to stay on course by watching the spume of the waves, the sun and the stars. Gasoline tanks separated the pilot and the navigator. Notes were passed when they wanted to communicate. Why haven't we seen a ship the pilot asked in one note as he knew four ships were along the route. Hegenberger waited for what the Reverend Maitland thought was a long time before he answered; you will see one in about ten minutes, and the priest recalls that in exactly nine minutes he spotted a ship. We were 750 miles at sea and I realized then that my navigator really knew his business." Hegenberger now resides, of all places, in Maitland, Fla.

Our former treasurer, **Loosh Hill** made some comments: "Through no fault of mine (the treasury) has some money left in it. It is the class officers, who wrote around saying, 'now is the time for all good classmates to come to the aid of the treasurer, or else.' However, I do agree with you the Class is losing quite a remarkable treasurer, for I am very sure, neither this, or any other class has ever had a Financial Officer who came up with three different balances in the same check book at the time of the 50th Reunion. I have been treasurer since long before 1957—I only



*Enos Curtin, '17*

reported on the years since '57, for that was as far back as the current check book went; and I am quite sure that the Statute of Limitations has run out most of that period, so I am not particularly liable. My memory is no longer any better than fair, but I think it was about 1937 before the Class had enough money to justify a treasurer, so it was about then I came upon the scene. I am not entirely certain what a resume is supposed to cover—but when it comes to an estimate of man hours expended, I am your man. This I learned in the subject called Report Writing, back in 1915 or 1916 . . . (my report follows). Estimate of Treasurer Man Hours—conclusion: For the years 1957 through July 28th, 1967; .0121 hours per week with total 521.021 hours. Note; as computers were not available for a considerable portion of the period in question, the above results were obtained by a series of close approximations."

Commenting further **Loosh** says, "It seems entirely likely as a result of my 73rd birthday, that my future is behind me. This was brought to my attention forcibly awhile back, when I was made an Honorary Trustee of the Bank, which means you can come to meetings alright, but you cannot vote, and you don't get paid. Believe I will not be going to anymore bank meetings. "Yes, I guess this is the year (1968) I retire alright, although I come to the office with considerable regularity. I feel it is necessary to do so for the country is in terrible trouble and it might be far worse if I were not on the job."

"The prescription for the martinis, which **Loengard** like, is a solemn and complete secret. It will be noted however, that they are roughly 4 to 1, made up ahead of time and allowed to age in a gallon jug. It was not necessary to change the recipe after **Dick's** gizzard was removed." **Loosh** advises on his acceptance card for the 51st, that each year we are not getting any younger. True, brother, true!

In the spring of 1967, **Enos Curtin** made his 15th trip to Southern Ireland to gallop



over the berms (an edge or shoulder running alongside of road, canal, etc.) following the hounds. Our **Nelson Chase**, made a moving sketch of Enos which did not appear in the '67 notes. So if anyone wishes to see it, Enos has it, having received it as a door prize at the September '16-'17 luncheon at the Chemists' Club. The picture here shows Enos aboard the noble steed, a former national steeplechase winner. Continuing in his love of horses Enos was missing the 51st Reunion as he planned to fly to Prague, Czechoslovakia, Russia permitting, to watch the National Races. It is hard to find out just what Enos is doing in this busy world; he is Director and Member of the Executive Committee and a Consultant for the new Madison Square Garden. In addition he gives considerable time to various charities such as the Foundation for the Blind. This past summer Enos made a trip to Alaska and reports the fishing and weather was fabulous and to top it all off, he has become a great-grandfather.

Prof. **C. E. Turner**, of Ocean Park, Maine comments, "My time with the Class was not long, but I have always been very appreciative of the cordial hospitality extended to me by the men of '17."

It has been a long time since we have seen or heard from Conchita Lobdell Pearson, so let me quote: "Frankly I do not want another 50th, . . . Don't forget I hope to continue to be the same Conchita to all of you."

How many of you have seen **Nelson Chase's** Class Memorial mural of the Rogers Building now hanging in the reception room of President Johnson's office? We believe '17 is the first class to donate a lasting memorial fully underwritten by the widows of the class.

In the April issue of *Physics Today* appeared a seven page article by **Robert S. Mulliken**, subject: spectroscopy, quantum chemistry and molecular physics, in which he sums up, "Where does the boundary between physics and chemistry lie? The development of molecular structure models show how ideas have passed freely between the two disciplines, with electromagnetic spectroscopy acting as the background continuum." . . . **Erling B. Stockmann** writes: "We have now left Long Island for good and live in Maine 12 months of the year, six winter ones in Damariscotta and 6 summer one at Pemaquid Point, delightful life."

We have a newspaper notice dated August 29th, "**Rudolph Beaver** . . . 81 of 5 Upton Road, Waltham, Mass. died Wednesday 28th in Belmont after a long illness. He was the husband of Helen Kellman Beaver of Waltham. He was born in Hungary, went to Canada in 1907 and came to Waltham in 1910. He was graduated from M.I.T. in 1917 and was a World War I veteran. Mr. Beaver was works manager of I.B.M. in Endicott, N.Y., then head of the Special

Products Division, of Gillette Company, Boston, and Works Manager of Raytheon in Waltham. In 1932 he formed Beaver, Inc., a company which manufactures surgical instruments in Belmont. Mr. Beaver was a member of the Belmont Methodist Church. Besides his wife he leaves a daughter Cynthia A. Beaver of Waltham and a son John R. Beaver of Lexington." Miss Beaver writes, "Dad passed away Wednesday afternoon, August 28, in the Belmont Manor Nursing Home three months to the day he entered there. He had a shock of the ileum on April 30, and was in the Waltham Hospital until May 28.

"**Gilead D. Morse** -77- retired New England Sales Representative for Otte Miller Company of York, Pa., died July 11, in Arlington. Morse lived at 42 High St., West Medford, Mass. Born in Salem, Morse was educated at the Institute. He leaves a sister Rowena H. Morse of West Medford." . . . **Dud Bell's** brother, Frank F., '10, died in September. Quoting Al Lunn, "He was a wonderful guy and a loyal alumnus. He served in both world wars and came out of World War II in command of a very rugged outfit as a Brigadier General."

Notice was also received of the passing of **Harold C. Alley**, of 203 North Catalina, Los Angeles, Calif. 90004, on June 8.

**Ed Aldrin, Sr.**, writes as of September 2, "I have been loaded all summer with my children and grandchildren. The last leaves Wednesday and then comes the closing of the beach house at Manasquan. You all know, I am sure, that I lost my wife on May 24. Ray Brooks feelingly wrote me from a knowledgeable viewpoint."

Seventeeners on the move: **William A. R. Brown**, 252 East Girard Avenue, Philadelphia, Pa. 19125; **Leo I. Dana**, Vineyard Haven, Mass. 02568. **George W. Donovan**, Village Villa B, Apartment 215, 7330 SW 82nd Street, South Miami, Fla. 33143; **William W. Eaton**, 5930 Franklin Avenue, Los Angeles, Calif. 90028; **Charles C. Gager**, 70 Beach Pond Road, Groton, Conn. 06340; **E. Howard Hutchinson**, 10 Dowing Street, Hingham, Mass. 02043; **Elijah Levi**, 10820 Georgia Avenue, Silver Spring, Md. 20902; **Walter F. Pond**, Box 291 Greybull, Wyo. 82426; **P. N. Rowe**, 90 West Street, N.Y.C. 10006; **Sidney E. Stuart, Jr.**, 1709 Jackson Street, Topeka, Kansas, 66608.

The regular monthly luncheons of the New York Tech Club are held at the Chemists' Club, 52 East 41st Street, N.Y.C., on the first Thursday of the first full week, come join in. Now that the M.I.T. Center is meeting at the Chemists' Club, any Tech man in the vicinity should drop in for lunch any weekday and sit at the M.I.T. round table.—**C. Dix Proctor**, Secretary, PO Box 336, Lincoln Park, N.J. 07035; **Stanley C. Dunning**, Assistant Secretary, 6 Jason Street, Arlington, Mass. 02174

# 18

As I assume my post as your Secretary, I note with pleasure a marked resurgence of class spirit. Any of you who attended the 50th reunion will verify this statement. I am happy to report the receipt of many letters commenting on our new lease on life in this direction. I shall do all I can to further cement our loyalty to '18 and M.I.T. To this end, I shall include all available items about you in these columns. In particular, I want to know what you are doing, and what has happened to you in this past half century. Please help by sending me your history, past and present.

Because of delays involved in transferring these duties to me, several happenings of interest have to be dusted off; you can blame red tape for the long time-lapse. Last April 22, **Frederick H. Norton**, Professor Emeritus of Ceramics at M.I.T. was awarded the John Jeppson Award and Medal for outstanding technical achievement and contributions to ceramic technology at the meeting of the American Ceramic Society. Eleven years after graduation, during which time he was engaged in research in the refractories industry, Fred joined the faculty at M.I.T. and was head of the Division of Ceramics until his retirement, in 1962. He wrote many treatises in his chosen field and his book, *Refractories*, is used throughout the world as a standard text book. A skilled sculptor, he works in terracotta and has received many national and international honors, amongst them an honorary doctorate (L.L.D.) from Alfred University, and a doctor of science degree from the University of Toledo. He is still active as a consultant to industry in ceramics. Amongst his hobbies is an experimental tree farm at his Gloucester estate.

We also note that **Bill Foster** added yet another degree to his list in June; one from Bowdoin College (Doctor of Laws). His other honors include degrees from Syracuse University (Doctor of Laws), George Washington University (Doctor of Public Service), and Rutgers University (Doctor of Laws). In addition to his success in the steel industry, Bill has served, and is still serving his country in many capacities, including Administrator of the Marshall Plan, Deputy Secretary of Defense, and presently, U.S. Representative to the United Nations Disarmament Commission. His skill, patience and diplomacy were major factors in the acceptance of the Non-Proliferation Treaty in June by the United Nations, one of the most dramatic successes to date which can lead to world peace. Now he is continuing his labors in the most difficult task of all; a disarmament treaty to be accepted by the United Nations. In all this work, his wife, Beulah, who charmed us all at Cambridge and Wianno, has been his constant companion and helpmate. They live in Washington, but work in Geneva, Switzerland.

On September 5th, a most dignified and impressive memorial service for **F. Alexander Magoun** took place in Rindge, N.H. The setting was in keeping with Alexander's wishes, in a beautiful church in a typical small New England town. The program had been planned by him, and we could feel his presence making all the arrangements and urging us to live life to the fullest. The Class of '18 was represented by the **Sax Fletchers**, the **Harold Webers**, the **Julian Howes**, the **John Kilduffs**, and the **Max Seltzers**.

Later that afternoon, most of us drove on to Cloverly Farms in Greenfield, the family homestead where Sax was born, for a visit with **Sax** and **Louise Fletcher**. We inspected the 600 acres, most of it virgin forest surrounded by mountains on every side. A most beautiful sight for us city slickers! Sax's story is the typical inspirational American success story. Shortly after graduation, he went to work for J. G. Ross Engineering Company as one of seven employees.

Twenty years later, he was President of the organization, and upon his retirement in 1960 as Vice Chairman of the Midland Ross Corporation, there were 1,500 employees. In addition to his business activities, he was involved in many civic and philanthropic organizations, and has maintained continuously a keen interest in M.I.T., an outgrowth of his great activity in class affairs as an undergraduate. From 1956 to 1953, he was Vice President of M.I.T.'s Alumni Association.

Since retirement, Sax and Louise have been spending more and more time at the farm. Here he oversees his model dairy with 70 registered Ayrshire cattle, all given loving care with the most modern equipment. We admired all sizes; from one day old calves to the adults. Sax is the gentleman farmer, but the vegetable and flower gardens also get his personal attention.

On September 6 and 7, the Kilduffs, Howes and ourselves attended the Alumni Officers' Conference in Cambridge—a most interesting get-together of M.I.T. people from everywhere. I make two observations to indicate the change in direction of our Alma Mater since our undergraduate days: (1) Professor Rosenblith's (Chairman of Faculty) concept of the consequences Ethos; i.e., M.I.T. considers the social consequences of discoveries of new truths in science or engineering. And, (2), Dr. John Gardner's (Germeshausen Professor at M.I.T.) stress on leadership; if we who are educated, dodge this responsibility by default, there will be no solution to our social, urban, political and group problems.

A recent note from **John Abrams** of Bishop, Calif., reports he has completed a 2600-mile trek in an F.W.D. "Scout" into the wilderness areas of Idaho and Montana. How about writing us about your travels and explaining to us tenderfeet what an F.W.D. "Scout" is?



*Representing the Class of 1918 at the memorial service for F. Alexander Magoun in Rindge, N.H., were (left to*

*right) Harold Weber, Saxton Fletcher, Mrs. Kilduff, John Kilduff, Mrs. Seltzer, Julian Howe, Mrs. Weber, Mrs. Howe, and Mrs. Fletcher.*

**Dave McFarland**, Class Secretary during our senior year, has written in several times. He retired in 1962 from the Atlas Powder Company in West Chester, Pa. His farm with fruit trees has been taken under eminent domain by the government and he fears his home, built in 1925, will be next on the list. Dave manages to travel and reports seeing **Harold Weber**, **Dick Wilkins**, **Ed Rossman**, and **Sam Chamberlain** in various parts of the country in the last several years. He is proud of his family—a fine wife, two daughters and six grandchildren.

**Bill Wyer** is still active with Wyer, Dick & Company in the New York area, but plans to retire in a year. Some of you may recall that in the '30's, Bill took over the wobbling Long Island Railroad, overhauled it, and made the trains run on time. . . . His recreations include golf (I won't repeat the score), race-horse handicapping (not profitable) and duplicate bridge as a member of the Team of Four of the University Club of New York. They are champions, and are looking for more opponents. Do you remember Bill was a member of the Class of '18 tennis team? How are you doing today, Bill?

**DeRoss Salisbury** (Pelham, N.Y.) is eastern representative of the Schwartz Organ Company. You can hear one in the Evangelical Lutheran Church, Brockton, Mass., there is another at the Hotchkiss School, Lakeville, Conn. . . . **Bertram Jones** is in the drugstore business in East Orange, N.J. He reports a recent visit from **Charlie Tavener** who filled him in on the doings at our 50th in Cambridge and Wianno. . . . I am happy to report that **Harold Collins** (Elizabeth, N.J.) is on the mend. Just before our 50th, he was confined to the hospital battling a myocardial infection. He writes that the recovery process is slow, but is going well.

**Harold Weber** was also felled by illness a week before our reunion. It is wonderful

news to know that he is now back on his busy schedule as consultant to the petrochemical industry. To conserve his energy, he is moving to the Prudential Apartments, Prudential Center, Boston, Mass., so he can more easily commute to Chicago, Washington, etc.

**Mrs. Loring Wirt** reports that Loring is ill at the United States Veterans Hospital in Albany, N.Y. He has been there for some time, and is receiving excellent professional care. You may recall he was interested in military science in our undergraduate days. His professional career was with General Electric in Schenectady, as an expert in gas turbines. This occasioned extensive travel, particularly when he was on loan to International G.E., at which time he lectured to many groups on his specialty. He enjoys news items from 1918.

**Herb Larner** (Montclair, N.J.) reports returning recently from a trip to Europe. Where did you go? How about telling us a little about your adventures there. . . . Copies of the class photograph taken at Wianno have been mailed to everyone. In the event that one did not reach you, I have a few extra and will be happy to mail you one upon request. This surprise to many of you was made possible by an anonymous donor—so there is no charge for this picture. If you wish to make possible future surprises, you may send a donation to the class treasury. Checks can be mailed to me, made out to M.I.T. Class of 1918.—**Max Seltzer**, Secretary, 87 Ivy Street, Brookline, Mass. 02146

# 19

**Max Untersee**, of Alhambra, Calif., recently received a certificate for 20 years of Federal government service. Mr. Untersee is an architect consultant in the Directorate of Civil Engineering, Space and Missile Systems Organization. Max began his civil service career with the U.S. Arsenal in Watertown, Mass.



From 1921 to 1938 he was in private practice as an architect; from 1938 to 1940 he worked with the Federal Public Housing Authority in Washington, D.C. He was a project planner of emergency housing for navy personnel during the war. He spent two years at the University of California, at the beginning of their post-war campus expansion building program and then worked for the U.S. Army Corps of Engineers. His son, Philip, is a '55 graduate of M.I.T.

**Edward Adams Richardson** writes that he has been retired for six years from the Bethlehem Steel Company where he was involved in new developments.

A long letter from **Fred Hewes**, who lives in Los Altos, Calif., says he hopes to get to the 50th. He has made two trips to the hospital this year; first, for the removal of a cyst and carbuncle, and a second time, for the removal of his gall bladder. He has made a remarkably quick recovery, and has resumed his daily chores of picking almonds, figs and garden produce at his home. . . . Fred sends us news of the death of **Edwin Morgan Pickop** in Honolulu on July 27, 1968. Ed was the retired Assistant Manager of the Board of Harbor Commissioners. His entire professional life was devoted to Hawaii, at first in the territorial Department of Public Works, and finally on the Board of Harbor Commissioners. Fred and Ed and their families became close friends when Fred was stationed at Pearl Harbor for three years in the 1920's.

We regret to report the death of the following members of '19: **Carlos Krebs**, Brookline, Mass., August 22, 1968; **Earle E. Richardson**, Rochester, N.Y., July 4, 1968; **Mrs. John B. Woodward** (Boudy), Ridgewood, N.J., June 20, 1968; **Cutter P. Davis**, Springville, N.Y., July 1, 1968.

A Certificate of Appreciation will be awarded to **Dean K. Webster**, for his efforts in behalf of M.I.T.'s 1968 Fund.

The 50th Reunion is coming soon. It will be fun to get together at M.I.T. and at the Cape for the big celebration in June, 1969. . . . After the 15th of November and up to April 1, 1969, the Smoleys will be in Florida and will look forward to seeing any members of '19 who are in the vicinity. The address is 1111 Casuarina Road, Delray Beach, Fla. Telephone: 305-278-4537.—**Eugene R. Smoley**, Secretary, 30 School Lane, Scarsdale, N.Y. 10583

## 20

After this long hiatus from last spring to this issue (the October/November issue caught me unawares as I was a thousand miles (believe it or not) east of Boston at Ingonish Beach, Cape Breton, Nova Scotia) I apologize for the delay and hasten to bring you up to date. A letter from **Stan Reynolds** expresses regret that

he and Dottie were unable to join us at Keltic Lodge but explains that all they did was take an auto trip across Canada to the Alaska highway and Whitehorse where they transferred to a Land Rover, crossing the tundra to their final destination. Stan says "If I survive I'll tell you all about it." We await word.

**Phil Byrne** writes that he and Marie are enjoying retirement and have done quite a lot of travelling in the past five years. They are both in good health, reports Phil. . . . **Frank Badger** had a good excuse for his absence on Alumni Day which he has faithfully attended for many years. He writes that they have been widening the highway right in front of his Ocean Mist Motel at Hollywood, Fla. This involved removing about three feet of his north wing so that he had an "open house" on Alumni Day. Now, after several months it is once more in shape. Such is progress!

A note from **Karl Bean** indicates that he is once more in the old Bay State. He recently moved from Goffstown, N.H., to Early Redberry Lane, Yarmouthport, Mass. May you enjoy many years of good health and happiness on the Cape, Karl. . . . **Don Dowling** died last May after a long illness. His widow, Marion, wrote that he had been serving as consultant in high vacuum engineering with the Roots Blower Division of Dresser Industries in Connersville, Ind. As we hardly need to be reminded, Marion adds, "Donald was always a loyal M.I.T. alumnus and greatly enjoyed the class get-togethers." We always enjoyed seeing him and shall miss him greatly. He lived at 415 Franklin Street, Connersville.

Several members of the Class have passed away during these several months, among them **Henry L. Nash** of Sarasota, Fla., who transferred from Harvard and was with us two years; **Everett Fuller** of Richmond, Va.; **Gerald Mains** of Silver Springs, Md.; and **Lawrence Ropes** of Beverly, Mass., an engineer with Chas. T. Main, Inc., of Boston.

Noted also in a class that is distinguished for its reluctance to stay put are a number of new addresses, namely: **Art Merriman** to Cleveland Heights, Ohio, 2314 Lamberton Road; **Pete Ash**, 10 Glengorra Court, Mahwah, N.J.; **Jack Herron**, 2212D Via Mariposa, Laguna Hills, Calif.; **Sid Griffin**, 300 E. Washington Boulevard, Lombard, Ill.; **Bat and Irene Thresher** have settled at Cocoa Beach, Fla., 2020 North Atlantic Avenue. We wish them years of well earned rest and recuperation after a job superbly done at M.I.T. and, in the case of Irene, for the Commonwealth. **Skeetz Brown** and **Henry Massey** have reported in from the Cape, Skeetz at West Harwick and Henry at South Chatham. We'd like to hear whether there are temporary summer addresses. **Morris Lipp** now resides at 2545 Flamingo Place, Miami Beach, Fla., the place he

kept going for so many years. **Eric Etherington** is at 142D Farrington Court, Lakewood, N.J.

Under **Peter Ryer's** able and vigorous leadership, plans for the great 50th Reunion are well under way and are shaping up into what promises to be the greatest ever. Those of you who haven't visited the Institute for some years are due for some startling surprises, to say nothing of the "new Boston." Better start making plans right now for June 11 to 15, 1970.—**Harold Bugbee**, Secretary, 21 Everett Road, Winchester, Mass. 01890

## 21

"In grateful recognition of distinguished service to the M.I.T. Alumni Association, the 1968 Bronze Beaver is awarded to **Irving D. Jakobson** '21. Through his manifold activities in support of M.I.T., through service to Clubs, Class, the Educational Council and Visiting Committees, he has given loyally, energetically and generously, extending himself beyond every commitment. And through his own unique scholarship program, he has expressed his devotion to the Institute in a way which brings ever-increasing numbers of young men and women to share his resolution and faith." This well-deserved citation accompanied the award of the Alumni Association's top honor to our '21 Vice President at the honors banquet during the National M.I.T. Alumni Officers' Conference on campus last September. Jake's accomplishments for the Institute and the Class of '21 are as outstanding as his stellar performance as a leader in the ship-building industry. His latest honor brings further distinction to our Class, which continues to lead all others with a record of five awards of the Bronze Beaver, going back to the inception of such recognition in 1955. Other recipients among our classmates are **Bill Sherry**, **Sam Lunden**, **Joe Wenick** and **Cac Clarke**.

Further awards announced at the Conference and to be made later this fall, include recognition of our two Class Agents, **Ed Farrand** and **Ed Dubé** for their roles in achieving for our Class the fifth largest amount among the 69 class units, thus aiding the Amity Fund to establish its fifth consecutive record-breaking total this year. Among those providing leadership for the Fund operations and objectives was **Sam Lunden**, Los Angeles architect, who was a member of the Amity Fund Board. In attendance at the pleasant, informative and interesting sessions of the two-day Alumni Officers' Conference were **George Chutter**, **Cac Clarke**, **Josh Crosby**, Maida and **Ed Dubé**, **Ed Farrand**, **Ruth and Irv Jakobson**, **Gertrude and Henri Pell Junod**, **Joe Morrell**, **Evelyn and Ace Rood**, **Helen and Ray St. Laurent**, **Ted Steffian** and **Joe Wenick**. **Anita and Roy Hersum** and **Herb Reinhard** were among those of the Boston area who joined our group at the banquet.

From the Mt. Chocorua area near North Conway, N.H., Anne and **George Schnitzler** wrote: "Good to see you two at Alumni Day. After viewing the ocean for five months in Florida, it is refreshing to be in the heart of the White Mountains, where we spend a month every summer. Just visited Sara and **Harry Goodman** in Hyannisport, where they are vacationing and found them well." . . . **George Chutter** reports that **Paul H. Rutherford** spent the summer in Europe, staying in Geneva a good part of the time. . . . **Capt. Preston W. Smith**, emeritus professor of mathematics, St. Lawrence University, has a new retirement address at Apartment 11, 300 River Street, North Weymouth, Mass. 02191. . . . **William L. Knoepke** writes that he has moved his retirement home to 3020 N. E. 40th Court, Ft. Lauderdale, Fla. 33308.

Further to last month's good news about the move of Graciela and **Helier Rodríguez** to these shores, they write, in part: "We plan on leaving Madrid August 31, proceeding to the north coast of Spain and driving westward to Vigo, where we shall embark on a cruise that will take us to Funchal, Madeira; Tenerife, Canary Islands; La Guaira, Venezuela; and end at Port Everglades (Ft. Lauderdale), Florida. We intend to live in Florida, either at Tampa or St. Petersburg, and will decide after exploring both places. We are quite excited and looking forward to our new quarters with the hope that we may be able to attend alumni reunions and visit our classmates." For the present, you can reach this grand couple by addressing: Antonio H. Rodríguez, c/o Mr. Frank Sierra, 3301 Gandy Boulevard, Tampa, Fla. 33611.

By this time, you have no doubt received letters from **Ray St. Laurent** and Interim Reunion Chairmen **Al Lloyd** and **Ed Dube** about our third Class Reunion in Mexico, to take place during the 21st annual Fiesta of the M.I.T. Club of Mexico City, March 13 through 15, 1969. Go see your travel agent and plan a tour of this interesting country to precede or follow our stay in Mexico, D.F. Through the courtesy of Nish Cornish, '24, "Mr. M.I.T. of Mexico," we have an enthusiastic letter from Club President Armando Santacruz B., '54, Reforma 116-804, Mexico 6, D.F., Mexico, saying: "Let's bring the whole Class of '21 to Mexico in 1969! Your honorary classmate, President **Howard W. Johnson** and Mrs. Johnson have promised to be our guests of honor. We are planning new attractions for the Fiesta. Further, Mexico City will have more to offer. The many Olympic Games installations, such as the Palace of Sports and the Gymnasium and Swimming Pool Building, are masterpieces of architecture and engineering. The Olympic Villa and another modern housing project built for the Games add to the interesting contrast of the very old and the very new in our city. Please come see us and share our good times!" For more information, write or phone **Al Lloyd** or **Ed Dube**



*Williston Wirt, '21*

at the addresses listed at the end of these notes.

Again our files are full of articles on **John W. Barriger**, Chairman of the Missouri-Kansas-Texas Railroad, variously sent by **Ed Dube**, **Sumner Hayward** and **Ray St. Laurent**. Early this year, John was optimistic about the continued recovery of the Katy which, he said, "runs against all laws of financial gravity." Katy Industries, Inc., the company formed to effect diversification of the railroad into non-transportation enterprises, reported acquisitions in the entertainment and consumer goods fields. Excerpts from an article in *Trains* include: "Katy's stockholders required in 1965 a missionary, realist, salesman and magician and they hired him in John Barriger. For it requires a human quotient compounded of more than knowledge, experience and drive to restore a detectable heartbeat to any corporation in such straits. It requires a certain *moxie*, a touch, an indefinable quality that you can't put through a computer or print in an annual report. John Barriger has it and Katy was to demand every iota of it. Typical of the man, his first move was to reinstall Katy's phone exchange in its St. Louis headquarters and rehire the girl that had manned it. Then he began calling for cash, customers and confidence."

Despite the fact that a railroad is constituted of trains, tracks, cars and diesels, the article says the Katy has even more in the intangible imprint of the Barriger personality. It says: "He disburses himself as deftly and freely as ever and his spirit manifests itself in innumerable unorthodox, engaging and productive ways." It further points out that John was born (Dallas) and reared (St. Louis) in Katy territory and "because of him the Katy is suddenly larger than life, a railroad more pertinent than its route-miles or gross or daily car count would imply." And we

all join with the many others who are watching John and wishing him well!

John E. Levensohn, '72, of Brookline, Mass., a member of the newest Freshman class at the Institute, is a nephew of **Hyman J. Levensohn**, Course XV, of 1874 Commonwealth Ave., Auburndale, Mass. 02166, the retired manager of the Personal Finance Co., of Roslindale. John is the 74th member of the Second Generation Club of '21 to enter M.I.T. . . . Many newspapers and magazines throughout the U.S. have carried the story of Her Royal Highness Princess Ubolratana of Thai, granddaughter of our late classmate, Prince **Somdet Chao Fa Mahidol** of Songkhla, Course VII. The Princess is a student at Concord Academy, preparing to enter M.I.T. next year for the study of nuclear physics. She is the daughter of Their Majesties King Bhumibol Adulyadej and Queen Sirikit of Thailand. . . . **Alfred J. Shaughnessy**, retired Hertz Vice President, advises that he has moved from Delray Beach, Fla., and can now be addressed via Rt. 2, Deerbrook, Wis. 54424. . . . **Rodman McClintock** has also retired and has moved from Philadelphia to Park Mansions, Pittsburgh, Pa. 15213. . . . **Leonard R. Jones** is back at his home, 2520 Noyes St., Evanston, Ill. 60201, after his year's service as professor of physics at McKendree College to fill a vacancy on the staff. Jimmie, for many years an executive with Commonwealth Edison Company, Chicago, is thus elevated to the second degree of retirement!

**Sumner Hayward** writes: "Your letter jogged Betty to finish her account of our Anglo-Irish trip. We recently had a Hayward family reunion for a week here in Ridgewood. My older sister came from California, my sister in Massachusetts drove down and my brother and his wife came from Silver Spring, Md. We all attended the 50th anniversary of a distant cousin, Stewart Keith, M.I.T. '16. On September 5, Betty and I take off for Cincinnati to board the 'Delta Queen' for a three-week trip on the Ohio and Mississippi Rivers to St. Paul and return. We will be with a group of 30 Appalachian Mountain Club members whom we know. Your visit to Vinalhaven, Maine, reminded me of the time our windjammer anchored there overnight during a cruise and I had a pleasant visit with Helen and **Ray St. Laurent** at their home on the island." A subsequent card, postmarked at Hannibal, Mo., showing a night view of the Gateway Arch, said: "Found **John Barriger** was in Chicago when I phoned his office. We're visiting Mark Twain's home this afternoon. Our boat docked right below the middle of the Arch." On the way back, Sumner wrote: "Talked to John Barriger today and he said the Katy is making progress. He invited us to his home but, unfortunately, time ran out." We are holding Betty's excellent account of the Hayward safari to England and Ireland for a later issue.

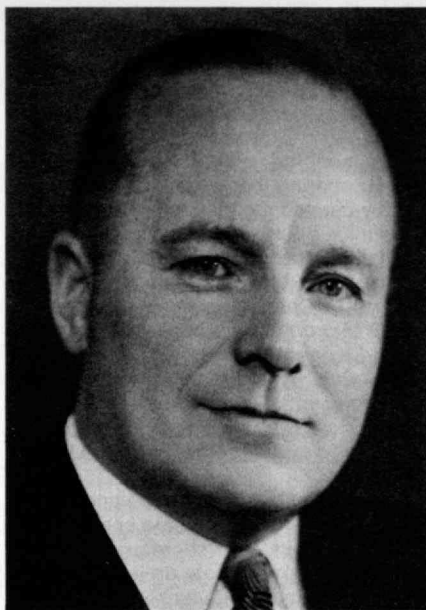
The Reverend **Williston Wirt**, 694 Priscilla Way, Claremont, Calif. 91711, has written



a much-appreciated letter, the more so because it was voluntary. Will says, in part: "I do get to see the *Review* and the University Club of Claremont, of which I am President, has a subscription. In reading the '21 Class News, I found the tribute to Dr. Samuel Miller very fitting. He was a great Christian leader. It was sad that he died when about to enjoy a deserved retirement. There were the three other men of our Class who later entered the ministry, including me, and I was a bit startled to learn that I am the sole survivor. This Pomona Public Library letter head is legal, since I am a Professional Substitute Librarian and serve about 15 hours a week in this fine \$2 million city library. We are part of a metropolitan system and have the collections of 12 libraries available. There are some 25 colleges within 25 miles of Pomona and the majority of our patrons are students engaged in serious research. I qualified for my credentials by study at a library graduate school when I retired at 65—to give me a stake in today's world in an activity I enjoy. I find my past experience is of value helping the coming generation prepare to take over the reins. I am retired in Pilgrim Place, Claremont, a colony of 300 former ministers, missionary workers, Y.M.C.A. and Y.W.C.A. executives. A close friend here is Reverend Raymond Blakney, M.I.T. '18, who has been prexy of two colleges, one in Greece. Next week we will drive to Alaska. Our son is in Juneau. We will camp in McKinley National Park, reported to be the best place to see and photograph wild animals, since it isn't overrun with tourists. My best wishes and appreciation for your years of service to our Alma Mater and especially to our aging Class of '21."

We wrote Will that the Reverend **William F. Hastings** has been removed from the class roster due to inability to locate him for many years; Will supplied an address, we have written and will tell you of results later. Will adds: "We had a glorious time on our seven-week tour of Alaska, camping in national parks and forest reserves and using auto ferries and railroad flat cars where available. The scenery is superb and it sure looks like a land of opportunity for engineers." He also remarks: "All plans made three years in advance must be tentative, but from here it looks possible, even probable, that Mrs. Wirt and I will join you in Cambridge for our 50th Reunion, June 10 through 14, 1971." That's real loyalty!

**John B. Mattson**, Counsellor at Law, 69 Sargent Street, Winthrop, Mass. 02152, wrote: "I retired as Chief Title Examiner of the Massachusetts Land Court in 1965, after 26 years service. Am busy and thoroughly enjoy retirement. Limited my private law practice and planned to do oil painting, but the brushes are still dry. For fun, I play euphonium in bands and bass tuba in orchestras. Am still a confirmed Rube Goldberg and agriculturist. Traveled with camera in the U.S. and Europe and have more than 12,000



*John B. Mattson, '21*

slides. Family: Wife, Elma, and four married children; Muriel, Radcliffe '47; Marilyn, Radcliffe '49, married to Dean John A. Knauss, M.I.T. '46; Hon. John B. Mattson, Jr., M.I.T. '52, in New Mexico Legislature; Major Melvin R. Mattson, M.I.T. '54; and 10 grandchildren." We asked John to elaborate and we must now condense a letter that deserves full publication. He says: "So many important diversities cross my path that I find myself working on a dozen at a time. I played in the Ashby Band 55 years ago and was its euphonium soloist last summer at the Ashby bicentennial. I've been a 'gadgeteer' since the time I contrived a drumbeater of the kind found everywhere today for the drummer of my 'Rising Stars' dance orchestra. Another gadget is a 12 foot wood horn, similar to the Alphorn—I call it the Matts-horn—which I have played in public. My inventions follow the idea of never performing a chore by hand without first contriving a gadget to do it. I have set out an orchard of 140 apple and peach trees; have made syrup and sugar from maples in Winthrop; and, during the war years, raised 31 varieties of vegetables. We always have a large garden of flowers. In 1959, Elma and I traveled in Europe and, in 1966, we toured Scandinavia. As Vice Consul of Finland for New England, with fluency in the language, a wide acquaintance with the people and good knowledge of the country, we were favored in all we had time to see. In 1955, we had driven across the northern part of the U.S., down the West Coast and back on a southern route. Later trips to see our children have taken us to many other parts of the U.S. I have prepared an illustrated lecture on Finland and my slides cover a wide range of interests. Elma and I are eagerly looking forward to the 50th Reunion. Our best to you and all in the Class of '21."

**Augustus B. Kinzel** has been elected a

director of the Kalvar Corp., New Orleans, a manufacturer of photographic film. . . . Maxine and your Secretary had an interesting session with **Joe Wenick** at the picnic opening the 33rd season of the M.I.T. Club of Northern New Jersey. Joe's retirement activities are legion—the latest, a hitch with the Small Business Administration in Newark. . . .

**Munroe C. Hawes, Sr.**, and Junior were runners-up in the Senior-Junior Tournament at the Manasquan River Golf Club. . . . Helen and **Ray St. Laurent** had dinner with Theona and **Al Genaske** in Lovell, Maine. All four will attend the '21 interim reunion in Mexico next March, as will Becky and **Elmer Campbell**, also of Lovell. . . . "Saints' Haven," the St. Laurent summer home on Vinal-haven, Maine, has been a busy M.I.T. center. After Ruth and **Irv Jakobson** left for Nova Scotia and Prince Edward Island, Louise and Don Carpenter, '22, moored there overnight and had lunch with the Saints. Christine and Walter Beadle, '17, also sailed down the Fox Islands Thorofare and tied up there to spend a few hours with Helen and Ray on their way south. . . . **Ed Dubé** reports an enthusiastic letter from **John J. McCloskey**, who has retired from his teaching duties and now receives mail at his home off Glen Drive, Whitinsville, Mass. 01588.

**William J. Sherry**, 1801 First National Building, Tulsa, Okla. 74103, writes, in part: "Sorry to miss last Alumni Day. I got as far as New York, but didn't finish some business on Friday and had to stay over. You would think that a person who has been out of school 47 years would have better control of his time. Our Bill is on a destroyer in the Southwest Pacific. Those in action over there certainly are astounded by the official tolerance of the communist-led young people in this country. Our shortage of Teddy Roosevelt type leaders is one of the deplorable conditions of our time. Our other son, Richard, is a senior at Notre Dame and will be in service next June. Our youngest daughter, Teresa, who was struck by a car seven years ago and spent more than two years in hospitals with five operations and many casts has, in spite of a shortened and stiff right leg, blossomed out dedicated to a medical career. She will graduate in a premed course at Tulsa University next February, when she will take a year's internship as a medical technician and then decide whether to continue or go to medical school. I didn't mean to make this so long but with eight children and eleven grandchildren how can you make it short? Margaret and the family join me in affectionate regards."

With deep sorrow, we record the passing of two of our classmates and extend to their families the sincere sympathy of the entire Class of '21. . . . **John James Winn, Jr.**, of 1949 Edgewood Road, Portland, Ore. 97201, died on March 28, 1968. Born in Haverhill, Mass., on July 15, 1897, he attended Haverhill High School and was associated with us in Course X. He was a loyal supporter of M.I.T. ac-

tivities and only distance prevented his taking an active part in our reunions. Despite his endeavor for anonymous accomplishment, his fame is widespread as the General Manager of the Port of Portland from 1951 to 1963 and its consultant since then. The Portland International Airport and the modern facilities of the harbor are monuments to the "knowledge, engineering skill, courage and persistency, the aggressive foresight, leadership and ability to bring people of differing opinions into a common unity" for which he has been memorialized by many organizations and publications. Earlier, Jack had served Ebasco, Stone and Webster, the Baltimore Gas and Electric Company and the Hartford Gas Company. He had been general manager of the Honolulu Gas Company, Vice President and industrial analyst of the First National Bank of Oregon and commercial manager of the Portland Gas and Coke Company. He saw service in both world wars and was awarded the Bronze Star with cluster and a citation as a Lieutenant Colonel in the Corps of Engineers. He was a life member of the American Association of Port Authorities and the Pacific Coast Port Association of which he was also a director. He was a director of the Airport Operators Council, the Portland Freight Traffic Association, the Inland Empire Waterways Association of which he was also executive secretary. His active memberships included the Portland Chamber of Commerce, the Northwest Rivers and Harbors Congress, Rotary, Veterans of Foreign Wars, American Legion, Propeller Club, the Military Order of World Wars and the American Gas Association. He also was active in the Arlington Club and supported its development of art, libraries and other cultural interests. He was the recipient of the "Old Salt" Award of the Junior Chamber of Commerce. He is survived by his wife, the former Leota Cutler of Fall River, Mass. We are indebted to Mrs. Winn for her warm letter of aid and we appreciate her request to be retained on the roster of the Class.

**Willard Anthony Emery** of 2232 East 32nd Street, Tulsa, Okla. 74105, died on September 2, 1968. Born in Boston on May 18, 1898, he prepared for the Institute at Mechanic Arts High School. At M.I.T., he was active in the Mechanical Engineering Society and was a member of the Track Team. Bill served in World War I as a private in the S.A.T.C. at M.I.T. He was graduated with us in Course II and subsequently did graduate study in metallurgy at Brooklyn Polytechnic and in business courses at Rutgers. Prior to going to Tulsa, he had been plant manager at the Holyoke, Mass., works of Worthington Pump and Machinery Corporation, in charge of all production and manufacturing. With his two sons, he founded Southwest Metal Finishing Company, engaged in all types of plating, anodizing, plastic coating, injection molding and electroplating of plastics, and was its board chairman. He and his sons later founded Bumper Exchange, Inc., of which he was Vice President. He is survived by his

wife, the former Ethel E. Shortall of Boston; a daughter, Mrs. Robert Lee, Holyoke, Mass.; two sons, Willard S., M.I.T. '50, and Robert S., Tulsa University, both of Tulsa; and 13 grandchildren.

We are indebted to Bill Sherry for his aid in preparing these notes and his friendly comments: "Bill was just as quiet in his adult life as he was back at the Institute. I used to see him almost daily as he and son, Bill, attended early Mass at the Cascia Hall Preparatory School in our neighborhood. His son married a daughter of a classmate of mine during my two years at Notre Dame. In his quiet way, Bill had great affection for M.I.T. and was an ardent supporter of the Institute and our class reunions."

The Season's Greetings to you and yours from all of your class officers and committee chairman. Your secretaries will greatly appreciate a note on your business or retirement activities, your travels and your family enclosed with your holiday greetings to them.—**Carole A. Clarke**, Secretary, 608 Union Lane, Brielle, N.J. 08730; **Edwin T. Steffian**, Assistant Secretary, Steffian, Steffian & Bradley, Inc., 19 Temple Place, Boston, Mass. 02111; **Sumner Hayward**, Assistant Secretary, 224 Richards Road, Ridgewood, N.J. 07450; **Leon A. Lloyd**, Chairman, Interim Reunion Committee, 35 Spruce Street, Westerly, R.I. 02891; **Edouard N. Dube**, Co-Chairman, Interim Reunion Committee, 216 Woburn Street, Reading, Mass. 01867

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In this crucial and critical time for the Class of '22 we again look to the future with joy in our hearts and enthusiasm on our lips. After having experienced 46 years as alumni, we now adopt the role of senior citizens, counsellors and donors which gives us the satisfactions of life in continued interest in happenings at the Institute. One of the nicer happenings this fall was the presentation of the 1968 Bronze Beaver Award to **Abbott L. Johnson**: "His decades of thoughtful concern for M.I.T., expressed through visiting committees, Educational Council and Alumni Fund leadership, his remarkable personal courage and his productive efforts on behalf of his own community all reflect honor on M.I.T. and provide a model for his fellow-alumni." We all know that no one could be more deserving than our friend Ab Johnson.

Among the recipients of Certificates of Appreciation for work in the 1968 Alumni Fund **Thomas H. West**, retiring from the Fund Board. . . In a shower of bouquets for his work as Chief of Finance and Statistics for the Federal Power Commission, **C. Ford Blanchard** has retired to 200 Maple Avenue, Falls Church, Va. He had previously been with Moody's and Standard and has devoted 35 years to the financial, administrative and regulatory aspects of the public utility business. He is now available in a consulting capacity.

It is a pleasure to report an additional honor given to my previous roommate of 1922, **Percival C. Keith**, as an innovator in chemical process engineering; for his leadership in the Manhattan Project; President, Hydrocarbon Research, Inc. (retired). For his outstanding contributions, he was elected to the National Academy of Engineering as announced by Eric A. Walker, President. This award recognizes an individual's outstanding contributions to engineering theory and practice and to the pioneering of new and developing fields of technology. The N.A.E. shares the responsibility given to the National Academy of Sciences by Congressional charter to advise the Federal Government on any matter of science and technology. Our president, **Parke Appel** reminds us of the possibility of a '22 Class Reunion at Mexico City in March 1969. He is also joining **Dale Spoor** and **Warren Ferguson** in planning for our 50th reunion in 1972. We are pleased to pass along the announcement that the firm of Russell, Chittick and Pfund will continue the practice of patent and trademark law under the name of Chittick, Pfund, Birch, Samuels and Gauthier in Boston. We are glad to acknowledge that **Yardley Chittick** has no retirement plans.

I am happy to report a good representation of our Class at the 1968 National M.I.T. Alumni Officers' Conference. Those noted in the advance list included **Irving Abrams**, **Parke D. Appel**, **Robert H. Brown**, **C. Yardley Chittick**, **Warren Ferguson**, **Oscar H. Horowitz**, **Abbott L. Johnson**, **I. Robert Loss**, **Theodore T. Miller**, **Dale D. Spoor**, **Fearing Pratt** and **Prof. Karl L. Wildes**. At that time, the appointment of Professor Paul E. Gray, '54, of the Department of Electrical Engineering was announced as the Class of '22 Professor to succeed Professor John Wulff. Our adopted classmate, Professor Wulff retired in June after a distinguished career of 37 years as a teacher and researcher. Professor Gray has been on leave in recent months while doing research at the University College of North Wales and will resume teaching and administrative duties at M.I.T. He will be experimenting in the teaching of electronic devices and circuits with alternatives to the traditional recitation sections.

The sympathy of the class is extended to the families of: Lieutenant Colonel **Samuel Patrick, Jr.**, of Fayetteville, N.C.; **Edson E. deCastro**, West Newton, Mass.; and Major **Paul W. George**, Concord, N.H. . . . Among the new addresses received are: Captain **John F. Halpin**, Nyack, N.Y.; **Thomas E. Shepherd**, Portland, Maine; Dr. **Eastman Smith**, Mountain Home, Kansas; **James M. Waechter**, Hollywood, Fla.; **George P. Anderson**, Hendersonville, N.C.; Vice Admiral **Frank E. Beatty**, Pebble Beach, Calif.

Your secretary has recently visited along the Maine coast to Bar Harbor and attended a Convention in Philadelphia without finding as pleasant a sky, air and water situation as we have in Buffalo.



If you can't drop in at the eastern end of Lake Erie to share this enjoyment, please share the good news of your activities with your Buffalo representative—who tells all—to all.—**Whitworth Ferguson**, Secretary, 333 Ellicott Street, Buffalo, N.Y. 14203; **Oscar Horovitz**, Assistant Secretary, 33 Island Street, Boston, Mass. 02119

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Hi! This is **Tom Rounds**, your new Class Secretary speaking. I succeed **Forrest Lange** who has meritoriously and reliably completed his five year stint and can now enjoy well-earned relaxation. Following our 45th year bang-up reunion at Bass River, several of us attended the Alumni Officers' Conference in Cambridge. **George Johnson**, **Forrest Lange** and I pretty much agreed that this one was one of the best. The central theme emphasized and demonstrated the tremendous concern of the M.I.T. faculty, administration and student body relative to the social unrest and ferment that, to a great extent, has developed as unrest and ferment resulting from the enormous change caused by technological advances in all fields and for which engineers and scientists are mainly responsible. We heard much about the changing image of the Institute, the broadening of the curriculum and the amazing liberalization of same in the humanities programs.

Highlights of various awards were Bronze Beavers to our old friend **Julius Stratton** and Abbott L. Johnson, '22, the latter "adopted" by 1923. **Cecil H. Green**, new President of the Alumni Association ably presided at the dinner on September 6.

Other classmates in the news for awards include: **Thomas B. Drew**, Professor Emeritus of Chemical Engineering at the Institute who received the 1967 Max Jacob Memorial Award of the A.S.M.E. for outstanding contributions as a researcher, educator and author. On the fun side the **George Johnsons** and the **Howard Russells** presented **Dave Skinner** with a suitably inscribed M.I.T. chair, at a dinner party. Dave, as you know, is our hard working, outgoing Class President. Alarm as to the capacity of said chair for Dave's avoirdupois proved to be unfounded but was the subject of much study and comment.

We are indeed sorry to report two deaths—that of **James V. O'Connor**, of Arlington, Va., on May 10, 1968 and **Alfred J. Perry**, of Bethlehem, N.H., on June 16, 1968.

Up-to-date addresses of the following Classmates are needed. Mail has either been returned or currently their address is unknown. **Chester D. Avery**, Mrs. **Josephine M. Gould**, **John C. O'Flaherty**, Rear Admiral **Lucien M. Grant**, **Walter J. Klein, Jr.**, and **Howard C. Maffitt**. On the subject of new addresses we

have the following: **Dewitt W. Bennett**, 740 Halsted Road, Rockford, Ill. 61103; **George A. Brown**, 7 Ashland Street, Melrose, Mass. 02176; **Malcolm L. Carey**, 116 Northlake Avenue, St. Lamber, Quebec Canada; **Pei Y. Chan**, Con-tonese Paper Mill, Namsheptao, Canton, People's Republic of China; **Marvin Eichenroht**, 4600 Broadway, San Antonio, Texas 78209; Mrs. **Forrest G. Harmon**, Apartment A, 1032 Golden West Avenue, Arcadia, Calif., 91007; **George R. Johnson**, Route 3, Box 94, Spellman's Point, East Hampton, Conn., 06424; **Frederick A. Kinch**, 8 Colt Road, Summit, N.J. 07901; Commodore **George F. Ludlow**, 16 Lyman Road, Framingham, Mass 01701; **Frederick S. Mann**, Main Street and Wakeland Road, Dover, Mass. 02030.

The 21st Annual M.I.T. Fiesta in Mexico City has generated much interest on the part of '23ers. I now have 39 reply cards indicating interest. Of these 32 will bring wives or other guests and the remaining seven apparently will stag it. This is scheduled for March 13-15, 1969. We will give you more details later.

News for this issue of the *Technology Review* is definitely skimpy. **Forrest Lange** told me to expect this since much came in during the summer months and was reported in the last two issues. Please, however, keep me informed as I will definitely need items of interest concerning you for the coming issues of 1969. Best wishes to all of you for the holidays and the new year!—**Thomas E. Rounds**, Secretary, 25 Ridge Road, Danbury, Conn. 06810

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Just as the serious business of writing these notes was about to begin the phone rang. "Hello, Chick? This is **Rock Hereford**." And so began a very pleasant conversation with our representative from the Carmel, Calif., district. Seems that autumn in that part of the country is little different from any other season, so the Herefords had come east to see if New England's foliage display could really be as phenomenal as remembered. Of course, like the fisherman who is always told "you should have been here last week," they were told by a friend in New Hampshire that "last year was really the year. This summer's been too dry." But everything is relative; they certainly saw color the like of which is unknown in Carmel. Rock is on his way to becoming an author. He is now doing research into the life of one of his former associates, a very amazing man, (another reason for the trip) and it will result in a book.

A feature story on Puerto Rico in a recent Boston *Globe* had quite a bit about one of our distinguished classmates. "Political chieftain for the statehood movement is the New Progressive Party's **Luis Ferre**, an oil tycoon from Ponce who may take the island's two

biggest cities in the elections this November. Ferre's millions do not scare the Puerto Ricans. In an argument that goes back to the days of John Fitzgerald Kennedy, the islanders argue that Ferre must be honest because he has all the money he can use. Besides, he sets them an example. With the prosperity they have won, the Puerto Ricans would like to be millionaires themselves." Don't know yet whether or not Luis will be with us at Bald Peak next June, but since there is an M.I.T. Corporation meeting at the same time and he usually comes up for these events, it is a good possibility. At any rate, brother-in-law **Al Roig** plans to be there. Not sure that Winnepesaukee fish will provide much excitement for him though, not after the account of one of his latest exploits that appeared in San Juan papers. It seems that the Humacao Angling Club, led by Captain J. Adalberto Roig, represented Puerto Rico at the 26th Tournament of the International Light Tackle Association in Baja, Calif., last June. They were after striped marlin, some of which run up to 300 or 400 pounds, and they were using twenty-pound test lines! Unfortunately two of the three-man crew, including Al's son, could not participate at the last minute, and couple of Californians took their place, but when the smoke cleared away the Humacao Club had come in first with 15 fish. That was in competition with 24 other clubs. Al says, "the fishing during our class reunion this year may not run to that weight category, but I am sure that for those of us who enjoy fishing, anything we catch is always fun." Tackle can be rented there, a one-pound for Al, and twenty-pound lines for the rest of us.

Another of our moneyed classmates, but one who rarely appears in print, did so in a *Forbes Magazine* article in September. "The Faces behind most Figures are highly visible ones, but there are other who prefer—and are able—to keep out of sight. One such is **William Rosenwald**, 65, a millionaire many times over. Since 1938 he has operated from the background as a philanthropist and financier. He is the controlling stockholder of Ametek Inc., a rather glamorous New York conglomerate that last year had sales of \$108 million and profits of \$4.6 million. You can't prove Bill Rosenwald's control by casually looking through the normal corporate records—but Ametek has nine directors and five are associates of Rosenwald. He also controls Western Union International . . . Mangood Corporation . . ." There's more, but it's a wonder that *Forbes* was able to get enough dope for even a two-column story. "Rosenwald and other American Securities executives simply aren't talking. One of them said: 'We just don't give interviews. Have you ever seen a story about us?'" Hiding their light under a bushel? But what a bushel!

A welcome letter from **H. Jacques Lehman** starts off with a paragraph that more of you might well take to heart.

"It has been quite a few years since I have written you of my doings so thought I would bring you up-to-date and then be in good standing when I see you next June." Last January Jac sold his business, but the new owners wouldn't let him go entirely. He's now Chairman of the Board, but he can take things a bit easier. The Lehmans have become world travelers like some of the rest of you, and they shake the winter snows of Shaker Heights for a few months in Arizona each year. Next June Jac and Mildred will include Bald Peak in their travel schedule.

Miss Bess Makris  
Technology Store

Would you please order academic regalia for:

Mr. **Richard T. Lassiter**  
72 Oxford Road  
Glen Ridge, New Jersey 97028

Mr. Lassiter will represent the Institute at the Centennial Convocation of Bloomfield College on September 17, 1968. His measurements are: height, 5'11"; weight, 185; hat size, 7½.  
Thank you.

Mrs. Janet Greenlaw  
Registry of Guests

Good to have those vital statistics on Dick, and to know that neither his weight nor his hat size have ballooned over the years.

Last spring we told you that **Ed Sheiry** had retired and taken up something called Hose Booms, a name that meant little to your secretary. It was a slight error. "One little correction," writes Ed. "I have had no time to retire and I don't expect to as long as my work is so interesting and I am able to keep up with it." Seems that Ed is still with Parsons, Brinckerhoff, Quade & Douglas, as he has been for 20 years, in charge of special projects in the U.S. and Latin America—investigations, reports, and designs. But Since 1966 he has also been president of Hose Booms, Inc., and this is quite a venture.

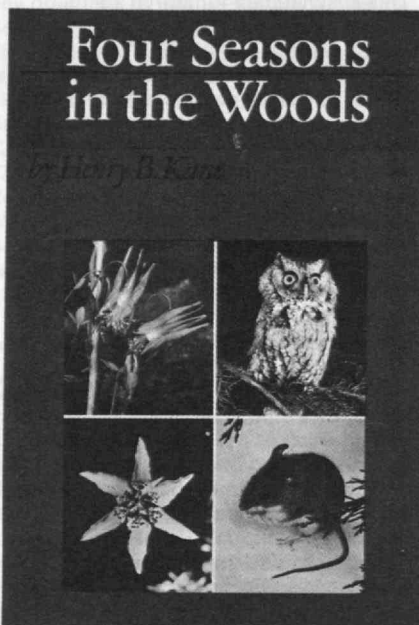
Ed invented the Parsons-Sheiry Marine Hose Handling Equipment for loading and unloading bulk liquid cargoes. These are huge affairs that tower over ships at dockside, lowering multiple hoses to tankers. They are awesome looking contraptions and obviously very successful, since they have been installed all the way from Perth Amboy, N.J., to South Wales and Peru.

Ed started his career as an instructor in Civil Engineering at M.I.T. He went on to become a professor here and at the University of Minnesota, then Head of the Departments of Civil Engineering at Robert College in Istanbul and at Cooper Union in New York. He had sorry news to report of a fellow Teacher, **C. Calor Mota**, Head of the University of Puerto Rico's civil engineering department until his retirement recently. A testimonial dinner had been planned by the Council of Higher Educa-

tion of Puerto Rico late last spring, but it was never held. On May 18, Dr. Candelario Calor Mota died. He was 70 years old and unmarried.

One further death to report that of **Arthur S. Vaughan, Jr.**, on June 23. No further details are available.

So much for now. We still have a fair number of items which are being hoarded for the lean months ahead. In the meantime, your class officers extend their very best wishes for the holiday season. If you're spending part of it with grandchildren, you can look forward to renewing your youth and then recuperating for the next month or so. And by the way, if a commercial is not out of order, if you have grandchildren about 6 to 10 years old, there's a new book just off the press that would make a dandy Christmas present. *Four Seasons in the Woods* is its title, published by Knopf. Modesty forbids disclosing the identity of the



author-illustrator. We'll be back with you again at year's end.—**Henry B. Kane**, Secretary, Lincoln Road, Lincoln Center, Mass. 01773

## 25

Some unfinished business must be attended to. The Class of '25 was not well represented at Alumni Day last June; but at the luncheon your Secretary found **Bill Asbury**, **Mal Blake**, **Ed McLaughlin** and **Jim Howard**, and it was most pleasant to spend a few minutes with each of these classmates. At the Alumni Banquet, Ed and Jim were joined by **Bob** and Grace **Hodson**. Your Secretary was unable to attend because he was leaving for a three-week trip to the West Coast. The first stop on this trip was at Denver and Estes Park, Colo., where he attended the Eighth Biennial Conference on Research Administration conducted by the Denver Research Institute.

While in Denver, Evelyn and I spent an evening with **Ben Oxnard**, and a most enjoyable evening it was. Ben was a most gracious host, as always. From Denver, we went on to Santa Monica, Calif., to a meeting of the American Society for Engineering Education, held on the campus of U.C.L.A. Attendance at this meeting was a "must" because for the next two years, I will be serving as a Vice President of A.S.E.E. and Chairman of the Engineering College Research Council, one of the three Councils connected with A.S.E.E. Following the meetings, we visited Disneyland, took a tour up the coast of California, into Yosemite and San Francisco. We flew back to Boston in time for me to at least be in the area on my official day of retirement as Director of the Division of Sponsored Research at M.I.T. For the immediate future, I will be working part time at the Institute as a Special Assistant to the Vice President and Treasurer; and any classmates in the area will be welcome at Room 4-144. I am continuing as Director of the Lowell Institute School where, at the moment, is appears that courses having to do with computer programming are the most popular. Evelyn and I are spending more time at our home in Chatham, Mass., any of you who happen to come that way should plan on dropping in on us. Bob and Grace Hodson found us once during this past summer, and it was very pleasant to see them.

Information from the 1968 Alumni Fund indicates that several members of the Class of 1925 will be awarded certificates of appreciation for their efforts on behalf of M.I.T. during the past year. Included in this group are our **Samuel R. Spiker**, **Edward C. Booth** and **F. Payson Hammond**.

A release from the General Motors Corporation noted that one of their top scientists and research administrators, **Mr. John M. Campbell**, retired as of August 31. John has been with the General Motors Research Laboratories for some 42 years and was widely known as a pioneer of modern fuels and one of the country's earliest combatants of air pollution. As early as the late 1940's, he began the organization of General Motors research programs in the air pollution field. These included the investigation of atmospheric chemical reactions and the relation of automobile emission to the atmospheric environment.

In 1953, he helped form and became the first Chairman of the Vehicle Combustion Products Committee of the Automobile Manufacturers Association. This Committee marked the formal beginning of the automobile industry's co-operative effort to control air pollution, and John became a spokesman for the industry in this area during the Committee's first years. He is a member of many technical, fraternal and honorary scientific societies, and holds a number of patents, and is the author or co-author of some 63 professional papers.



During these several months, word has come in of the deaths of a number of members of the Class of 1925. In most cases, little information is available, and some of the deaths are very late in being reported.

**William R. (Rusty) Blair** has provided information regarding **Baer Connard's** retirement from the Bath Iron Works at Bath, Maine. Baer's retirement actually took place last February, after nearly 40 years of service with the company. At a retirement banquet, among the many speakers was the President of the company, Mr. James Goodrich, who announced that the Board of Directors had elected Baer a full Vice President on his retirement in recognition of his outstanding service and great contributions to the company. During his tenure there he was exposed to many facets of the operation and was generally acknowledged as a man well versed in all aspects of the company's

a heart attack at his home in Bristol, Maine, on July 9, 1968. He had been living in Bristol since his retirement from the Army in 1957. Bill noted that he had served with Colonel Possiel at his last post before retirement and lived in adjoining quarters, and that up to the time of his death he was active and enjoying retired life.

**James Elliott's** wife wrote to inform your Secretary that Jim had passed away in Wilmette, Ill., on April 13, 1968.

Other deaths reported from the Alumni Records Office were: **William C. Vose**, on January 31, 1966; **George J. Conway**, on August 20, 1967; Brigadier General **Edgar P. Sorensen**, on December 22, 1967; and **Albert M. MacCleery** on January 8, 1968.—**F. L. Foster**, Secretary, Room 4-144, M.I.T., Cambridge, Mass. 02139



*Retirement festivities for Baer Connard. Guess which one is Baer!*

business, from ship construction to trials. In addition to his corporate responsibilities, Baer was also recognized for his outstanding contributions to the City of Bath where he served as Chairman of the Bath Water District, and was also a leading proponent and supporter of the Bath Memorial Hospital. At about the same time that Baer retired, his wife retired as a Volunteer at the Bath Memorial Hospital Coffee Shop; for almost six years she had been most active there providing patrons with cream puffs, eclairs, and other delicious foods. She also was honored with a retirement party at which the Coffee Shop Chairman presented her with a gift of a silver tray engraved "To Clarabelle Connard for 5,000 Volunteer Hours at the Coffee Shop."

Colonel **Edgar R. C. (Bill) Ward** wrote from Falmouth, Maine, that Colonel **R. J. Possiel** (Retired) died suddenly of

## 26

It's such a beautiful morning at Pigeon Cove that these notes must be put together quickly so your Secretary can go out and make the best of it. In the memory of all New Englanders there has never been such a long stretch of perfect weather. I haven't counted, but have heard 100 days mentioned. In any event, the sail boat is still in the water in early October, which never happened before—the grass is green—the flowers still blooming and bright red tomatoes hang from our eight vines. **Pete Doelger**, **George Gilman**, '23, and their wives were here for cocktails last evening to witness the moon rising out of the ocean a bit south of east, quite a performance to be able to put on for your friends.

We all went out to dinner and upon our

return enjoyed the second act of the performance with the moon now high in the sky and reflecting on a shimmering sea while we sat in the darkened living room sipping coridals with Beethoven's "Moonlight Sonata" emanating from the hi-fi. Kinda romantique for a group of senior citizens—a term that I don't like but for which most of us now qualify or will shortly. Guess we should be happy to qualify since at the memorial service for M.I.T. alumni in the M.I.T. Chapel on Alumni Day there were 16 members of the Class of '26 listed. We will not repeat the list because it is our practice to report these things during the year. We have a good accumulation of news items but one stands out, and since we do want to include most of it, this is going to be our "news" for this issue.

The M.I.T. Club of Northern New Jersey presented their Outstanding Alumnus Award 1968 to our classmate, **A. Donald Green!** The award was symbolized by an engraved Paul Revere bowl bearing his name. We are proud to quote from the citation. "Don, who resides at 720 Lawrence Avenue, Westfield, N.J., graduated from Massachusetts Institute of Technology in 1926 with an S.B. in chemical engineering and acquired his S.M. in post graduate engineering practice in 1927. Over the subsequent 39 years of a dedicated and distinguished career he gained 17 patents in his chosen field and, when he retired in 1966 he was a vice president in a part of the Standard Oil Co., New Jersey, Complex. Prior to the Jersey Standard years he was for three years with Allied Chemical Corp.'s Atmospheric Nitrogen and Solvay Process divisions. From 1930 on he was engaged in practically all of Jersey Standard's domestic chemical projects, including the early investigations of synthetic rubber. In 1935 he left Baton Rouge, La., for Linden, N.J. to join Esso Research Center as Director of the Development Division.

"In this capacity his responsibility often involved plant design itself for new chemical processes that embraced a wide variety of intricate ingredient combinations. His close association with synthetic rubbers, derived from petroleum, lead naturally to fulfillment on his part in large measure of the design and engineering task which furnished the butyl rubber facilities built by the governments of Canada and the United States in World War II. In 1958, he was named vice president of Enjay Chemical, Inc. with offices at Rockefeller Center, N.Y.C., in charge of such areas as project development, budgets, appropriations, market research and development, plant expansion and new products, plus special duties as assistant to the president:

"At M.I.T., to which Don Green matriculated via Boston English High from his native Dorchester, Mass., he was active in the Chemical Society, Stylus, and two of three years on *The Tech* were as night editor. He co-authored 'Petroleum chemicals' in the Encyclopedia of Chem-

Frank Massa, '27 (far right), gave the following advice to the Revere High School graduates at their June commencement.

"...if there were only one single thought that I would permanently engrave into each of your minds, it would be to avoid the easy road in any of your endeavors, and follow those paths that require effort and hard work, for it is in our continued exertion of effort that we expand our knowledge and improve our ability to keep abreast of our rapidly advancing frontiers."

A. Donald Green, '26 (right)



ical Technology. His professional societies include: Amer. Institute of Chemical Engineers, Amer. Chemical Society, Society of Chemical Industry, Amer. Association for Advancement of Science.

During active membership over the years in the M.I.T. Club of Northern New Jersey Don was elected and served as the 25th president, for the year 1959-60. His interest and participation in behalf of this organization always remained at high level as, for additional examples, his services of several terms on the Board as well as time on various working committees. He performed his duties as regional vice president of the important M.I.T. Educational Council in New Jersey over a long period.

"He has always been doing something to forward the interests of M.I.T. and the interests of M.I.T. in New Jersey. This 1968 Award goes well-deservedly and with all our best wishes to A. Donald Green. It was at Baton Rouge, La., that Donald Green met June Whipple his lovely wife-to-be. They were married in 1935 when Don's transfer was made to Linden, N.J., Esso Research. They have three daughters and, now, three granddaughters." What can a Class Secretary add to the above except to again say that we are proud of you, Don.

To you, to all '26 men and to other readers of our Class Notes, may the Holidays be pleasant and let's look forward to 1969 as a year in which a great many of us will retire, with enthusiasm. If a good number of you have as many plans as your Secretary, there's a lot of activity ahead for '26. See you in January. Cheerio—**George Warren Smith**, Pigeon Cove, Mass.

# 27

The Bronze Beaver, an award in recognition of distinguished service to M.I.T., was presented to **Harold W. Fisher** in early September at the National M.I.T.

Alumni Officers' Conference in Cambridge. The citation reads: "As 40th Reunion Gift Chairman for his class and a leader of the M.I.T. Alumni Center of New York, his ready acceptance of demanding tasks and his zeal in their effective fulfillment mark a level of service to which all alumni can aspire." The class' congratulations go to Hal for these accomplishments and this recognition of them.

**Dike Arnold** saw **Bob Hancock** and reports Bob in good shape and so is business at Hancock Industries in Jackson, Mich. He has sold Hancock Telecontrol which makes equipment for computer control of industrial production. Bob sends a cordial invitation to '27ers to stop and see him. Bring your golf sticks but be warned that Bob's handicap is 8! Through Bob, Dike also learned that **Frank Mesker** is doing well in retirement and has been aboard this year.

**Frank Massa** graduated from Revere (Mass.) High School in the spring of 1923. This year, 45 years later, he was the guest speaker for the commencement. He is president of Massa Division, Dynamics Corporation of America, Hingham.

Through the efforts of **Dick Hawkins**, Class Agent, and **Bill Taggart**, Class Estate Secretary, '27's contribution to the Alumni Fund for the year ending this June was \$19,457. It was low due to its being the year after our 40th reunion gift. Of the 446 men and women on the active class roll, 203 contributions—or 46 per cent.

I saw **Dick Hawkins** at the National M.I.T. Alumni Conference in September and was sorry to learn of the death of his father, Edgar M. Hawkins of Hingham, who was one of the oldest M.I.T. Alumni from the Class of 1897. . . . The Alumni Association has reported that during the past year three deceased members of the Class were memorialized by their friends through gifts to M.I.T.:

**Samuel Bernard Gahm, John M. Kucharczyk and Elwood J. Umbenhauer.**

There are many new addresses: **Andrew Anderson**, 1251 N.E. 27th Avenue, Pompano Beach, Fla. 33062; **William F. Bingham**, 1835 S. E. 32nd Street, Portland, Ore. 97214; **Dr. Emily M. Bixby**, 28 Davis Avenue, Wrentham 02093; **Nelson O. Clark**, Route 1, Box 143, Harrison, Ark. 72601; **William M. Crane, Jr.**, Central Road, Middlebury, Conn. 06762; **Chester A. English**, 4331 N.W. 13th Avenue, Pompano Beach, Fla. 33060 (see Anderson above); **George D. Fexy**, 2018 Janlyn Road, Jeffersonton, Ky. 40299; **Fred M. Harrington**, c/o Lucy Martrick, 931 Jackson Street, Allentown, Pa. 18102; **Raymond F. Hibbert**, 26 Kelly Green Road, New Canaan, Conn. 06840; **Park A. Hodges**, 1401 North Broom Street, Wilmington, Del. 19806; **Edward A. Leach**, 2072 Greenbriar Drive, Springfield, Ill. 62704; **Leroy G. Miller**, Lutheran Church in Liberia, Box 1046, Monrovia, Liberia, West Africa.

**Edward Sanel**, 200 Osborne Drive, Silver Spring, Md. 20910; **Bradford R. Stetson**, 2255 Palmtree Drive, Punta Gorda, Fla. 33950; **John A. Swift**, RFD 106 Marcey Drive., Southington, Conn. 06050; **Charlton P. Whittier**, 2219 Dundas Road, Toledo, Ohio 43606.—**Joseph S. Harris**, Secretary, Box 654 Masons Island, Mystic, Conn. 06355

# 28

We don't know how the *Review* plans to use one of the highlights of the National M.I.T. Alumni Officers' Conference, held in Cambridge September 6, but we certainly intend to use in these notes every word of the 1968 Presidential Citation that was awarded to the Class of 1928. All five hundred members who attended this conference heard the president read: "In grateful recognition of distinguished service to the M.I.T. Alumni Association the 1968 Presidential Citation is awarded to Class of 1928.





Walter J. Smith, '28 (far left), has received the Award of Merit of the American Society for Testing and Materials.

Carl M. Loeb, Jr., '28 (left), was among those on the program of the Business Leader's Conference on Crime and Delinquency held in Chicago.

Possessed of a unique spirit since its undergraduate days, the Class of 1928 has always been an example for others. Hundreds of its members have been officers, workers and committee members in all phases of Alumni Association activities; the Class has consistently maintained an outstanding Alumni Fund record; it was innovator of the on-campus 25th reunion in 1952, a pattern followed by every subsequent 25th reunion class, and now is innovator of the on-campus 40th reunion. For this record the M.I.T. community has been enriched in many ways." We are confident that all members of our Class are very proud of this award, the first in an annual series of such awards to outstanding classes. Of course we earned this certificate, but we are sad that the one man most responsible for the outstanding activities of our Class is no longer with us, **Ralph Theodore Jope**. We endeavor, however, to continue the tradition of dedicated class service under the leadership of **Jim Donovan**.

Perhaps it is fitting at this time to note that individual Certificate Awards were presented to the following: **Charlie Worthen**, our Class Agent; **Homer Burnell**, Special Gifts, Chicago; **A. Archibald**, Special Gifts, Pittsburgh; and **Gerard Patrick**, Regional Chairman, York, Pa. . . . We might also note while on the subject of the Alumni Officers' Conference that our Class was represented by the following dignitaries: **Arnold A. Archibald**, **James and Fran Donovan**, **Newton S. Foster**, **Shikao Ikehara**, **Morris and Claudia Klegerman**, **William S. McClintic**, **Rudy Slayter** and **Abraham Woolf**.

**Walter Smith**, a senior staff member of Arthur D. Little, Inc., Cambridge, Mass., was recently granted the Award of Merit by the American Society for Testing and Materials (A.S.T.M.). Established by A.S.T.M. 19 years ago, the Award of Merit is given to recognize individuals who have rendered distinguished service to the society.

A native of Boston, Mass., Walter received his S.B. degree in chemical engineering in 1928 and his S.M. degree in 1935 from Tech. He has been associated with Arthur D. Little since 1928 and his major professional activities are in the area of industrial research, primarily in commercial products and manufacturing processes. During the past 20 years, however, he has also been concerned with hygrometry, air, gas, and liquid cleaning, air pollution control, and the development of air and gas cleaning equipment. At Arthur D. Little, Walter is the leader of the Engineering and Chemistry Group in the Research and Development Division. He is a member of the American Institute of Chemical Engineers, American Chemical Society, and the Air Pollution Control Association. Walt has authored many papers on industrial research, air cleaning, filter development, and air sterilization. He holds several patents on hygrometers and on a high-efficiency filter.

You might be interested in the friendly note we received from **Fritz Rutherford**, Frogmore, S.C. Although addressed to your Secretary, the compliments are intended for the Reunion Committee. "Jo and I have just returned home after a good trip to Cambridge and other points to see family and friends. Of course, the highlight of the trip was the 40th reunion at M.I.T.—really fabulous.

"I especially wish to congratulate and to thank you for the outstanding job you did on all the publications and particularly for the book, *The Class of 1928*. That represents much time and effort. I certainly do appreciate the results of your labors. . . . After just recently traveling through the South Seas, the islands there, New Zealand, Tasmania, Australia, Singapore, Bangkok, Hong Kong, Taiwan, Japan and the outer islands of Hawaii, we shall remain home for a while. This trip was wonderful, enjoyable and certainly broadening, but it is good, too, to be home for a while. We live on St. Helena's Island between Savannah

and Charleston where the fishing is good and we are able to play golf the year round. . . . Please keep us and our location in mind when ever you are in this area and stop in to see us."

A letter from **John Melcher** states: "I had a side bet on the great Electric Car Race with one of my colleagues from Cal Tech. I asked our computer to make me a card to go with the presentation of his loot. Thought you'd be interested in what the computer produced. 'Volts-wagen sparks triumph or never underestimate the power of the computer or many are stalled when fuses are frozen. The electric corvair from Mass. Tech., Burned its armature into a wreck. The time that it owed, Because it was towed, Fielded microbus surge for Cal. Tech. Congratulations on C.I.T. Sneaky Perseverance.'"

We don't often get **Carl Loeb's** name in Class notes but here is an opportunity to express admiration for a classmate who is operating above and beyond normal duties. Carl M. Loeb, Jr., was among those on the program of the Business Leaders' Conference on Crime and Delinquency held in Chicago's Ambassador West Hotel. Top experts discussed the role businessmen can play in fighting crime and delinquency, seeking to inform and then to involve the Illinois business community in the fight against crime. The conference was sponsored by the National Emergency Committee of the National Council on Crime and Delinquency.

A note from the Alumni Office informs us that **Elisha Gray**, of our Class and a member of M.I.T.'s governing board, and, incidentally, Chairman of the Board, and Chief Executive Officer of Whirlpool Corporation, was recently (last April) elected to the board of directors of A. O. Smith Corporation, Milwaukee. . . . And a news release from Sears tells us that **Joe Gaffney** retired as General Purchasing Agent for Sears, Roebuck and Company in Chicago, on July 31. He began

his Sears career as a trainee in 1928; and during his 40 years of service held a number of store management positions in the early years of retailing and was later buyer of store fixtures and equipment during the company's post war expansion. He served with the U.S. Army during World War II; and after being discharged with the rank of major, he was assigned on loan from Sears to the Federal Government Surplus Property Administration.

In 1950 he was appointed General Purchasing Agent. Joe had intended to attend our 40th reunion but business circumstances prevented this. He says, however, that he hopes to attend our 45th, and we harbor the same hope. . . . **Charlie Worthen** sends us a clipping from *Electronic News* of June 24, which states that our classmate, **John Leslie**, has been elected Vice President International Affairs, a new post, at Pan American World Airways of New York. He was Vice President and Assistant to the Chairman. After throwing a myriad of bouquets to the Reunion Committee, your Class Secretary, and everybody in the Alumni Office, Charlie prays that we have a good crop of blueberries and apples on our New Hampshire hillsides and, "See you at the 50th if not before (that is assuming we are both around in 1978)." To this we give no answer. Ye gods, at this point in life we don't tempt fate.

And from **Jim Donovan**: "I have an excellent, friendly long letter from **E. Vernon Lewis** which I would condense to say that Vernon apparently was sick for quite a while but feels that now he is over it. Being the kind of guy he is, he kept on working all the time. He is teaching at Ursinus College at Collegeville, Pa. Bonnie is also teaching there—quite a husband and wife team. This last year he received the Lindbach Award for outstanding teaching and used it to establish a fund in memory of his father." . . . **Bob Tucker** reports, "I have retired to a quiet place out in the country a few miles from Lake Erie shore; never a dull or idle moment; maintain interest in current events and progress." . . . A note from **Howard Emerson** reports that he could not attend the reunion because of teaching chores the first half of the summer. He hopes to be free in June in the future. We assume that means for June reunions. In case we missed an earlier report, Howard stepped down in January as head of the University of Tennessee's industrial engineering department after more than twenty years as professor.

A post card to **Jim Donovan** from Nat and **Ship Shipley** dated June 18 states: "We have just about completed the second leg on a many legged journey to Scandinavia, a fourteen-day sea trip from Bergen around the Nord Cape to the Soviet border and out a few miles from Murmansk. I know the 40th reunion must have been a huge success. We can hardly wait to read about it in September when we return." . . . **Bob Larson** regrets

to report that **Bill Birch** had a rather serious operation but is recovering nicely. **Bob** will keep us informed. . . . **Ted Wood** reports that he is now in Cincinnati for American Airlines and working on budgets and cost control. After 35 years, his retirement is coming up soon.

And **Bill Hall** this past summer was appointed Director of Development Engineering on the staff of the vice president of engineering for Raytheon Company. His duties will include supervision of company-wide independent development programs and coordination of company technical capabilities. **Bill** has been with Raytheon for 27 years.

**Al Pearsall** reports three daughters, four granddaughters and four grandsons. He teaches senior advanced math, calculus and computer math at the Rome Free Academy in Rome, N.Y.

**Ray Jack**, Wood River, Ill., sends his greetings to all his friends in the Class. He continues: "Because of poor health, I retired from the position of Assistant Manager of the American Oil Co., Wood River Refinery May 1, 1966. The health situation is about the same." We all send our greetings and best wishes to Ray. . . . **Bob Proctor**, Leominster, Mass., laments, "Looks like I won't make the 40th, two graduations, a wedding and visits from in-laws from Florida and California, all at once and at the wrong time. That's what comes of having four children after your fortieth birthday. Greetings to all."

We had intended in our last report to list the names of those who had passed on this past year and who were listed in the program at the memorial service held in the chapel on June 10: **Edward Birkenwald**, **Fred B. Brown**, **Arthur Campopiano**, **Middleton M. Chism**, **Edwin A. Francis**, **Sidney B. Jewett**, **James P. Mitchell**, **Arthur A. Nichols**, **Charles Richheimer**, **Henry E. Simonds**, **Wesleyan Watson**.

This brings us deeper into the only unpleasant feature of Class Notes—the obituaries. On the back of his alumni gift envelope **George Muir, II** stated, "I have built a new home adjacent to my previous one in Cohasset, Mass., and I can still spit into the Atlantic Ocean. I am working as Resident Engineer for Crimp, Brown and Fisher, architects. I have invented and patented three items: (1) Synthetic lobster bait, (2) A golf ball center for distance and accuracy, and (3) A self-elevating mattress for child's crib. I play lots of golf and still love a wonderful wife. My son rows in the first boat at B.U." So after this very pleasant note, the first report from the Alumni Office to change address tells us that **George Muir, II** died suddenly on July 21, 1968. . . . It is also our sad duty to report that **C. Jerome Bitzer** of Westfield, New Jersey passed away June 5 of this year. . . . **Mrs. Ermanno A. Basilio**, of Ithaca, N. Y., recently gave a gift to the class Fund, "In memory of my late husband." **Ermanno** died March 30, 1963.

This just about cleans out our cupboard of Class News. We decided to shoot the wad in this issue and to tell you people that we have only one or two letters in reserve. You better start writing or mailing if this space is to be occupied in future issues. For this we shall thank you.—**Hermon S. Swartz**, Construction Publishing Company, Inc., 27 Muzzey Street, Lexington, Mass. 02173

## 29

Through the Alumni Office, our faithful sorcerer's apprentice for news, we learn: **Walter F. Burke** has been named president of McDonnell Douglas Astronautics Company in Huntington Beach, Calif. **Walter** is also Chairman and Chief Executive Officer of Conduction Corporation (a subsidiary of McDonnell) in Ann Arbor, Mich. . . . The Worcester (Mass.) County Institution for Savings has a new Chairman of the Board and Vice President—**Arnold Conti**, of 103 Summer Street, Shrewsbury. We are sure **Mary Conti** is proud of her husband, who joined the Institution for Savings in 1954 as Executive Mortgage Officer and since has served as Vice President and Trustee as well as President.

We received a copy of "Prerequisites of Mobility" by **Robert R. Philippe**, Chief of the Science of Technology Division, Development Directorate, U.S. Army Material Command, which appeared in the May 1968 issue of *Army Research & Development*. **Bob** has taught or lectured at M.I.T., Carnegie Institute of Technology, University of Illinois and George Washington University. He has written articles ranging from rock mechanics to photo-elasticity and is now writing a text on transport and mobility. . . . The March 1968 issue of *New England Business* told the success story of Farmer Electric Products, Inc., located at Tech Circle in Natick, Mass. The twenty-one-year-old company has doubled its sales every three years since it was founded by **Ed Farmer** and is fast approaching a total working force of 200. Originally a consulting-engineering business, the firm began its growth as the result of a patented cold cathode timer developed and manufactured by Farmer Electric. Product innovation and Flexibility have kept the company on the grow, but the main ingredient of their success is attributed to the close-knit organization's total employee effort.

Belated congratulations to Mr. and Mrs. **Murry M. Brimberg**, of Silver Spring, Md., whose daughter, **Carol Schulman**, presented them with their first grandchild, **Erica Hancy**, in May. **Carol** and her husband, **Dr. Schulman** (a Clinical Associate at the National Institute of Health) now live in Washington, where she is continuing her studies at Georgetown Medical School. Daughter **Judith** and her husband, **Dr. Sherwood** (Chief of Endocrinology at Beth Israel Hospital), have moved to Boston, where she is working toward a Ph.D. in biology. **Murry** writes, "the new grandparents



continue actively in management of Brimberg Associates, Inc., an electronics marketing organization founded fifteen years ago in Washington. Extracurricular interests include travel, theater and music, and promotion of religious education institutions."

**George M. Armstrong** advises that his present employer is Honeywell Inc., Livingston Electronic Laboratory, Montgomeryville, Pa., and his current interest is research and development in electrochemical devices, especially power sources (low temperature, high energy) for space probe applications.

**Ted Malmstrom** of Needham Heights, Mass., retired from the U.S. Bureau of Sport Fisheries and Wildlife, doesn't have time to get bored thanks to his wife, Florence, who finds all sorts of things for him to do around the house. Ted sends his best to all classmates. He is a member of **Bill Baumrucker's** 40th Reunion Committee, along with some of his Massachusetts neighbors: **John Wilson**, of Boston; **Frank Mead** and **Sol Horwitz**, of Belmont; **Paul Donahue**, of Nahant; **James Fahey**, of Boxford; **Ed Farmer**, of Natick; and **Arnold Conti**, of Shrewsbury. Other committee members are **Eric Bianchi**, of Summitt, N.J.; **Elmer Skonberg**, of Louisville, Ky.; **Bill Bowie**, of Slingerlands, N.Y.; **Wes Walters**, of St. Paul, Minn.; **Wally Gale**, of Melvin Village, N.H.; and your Secretary. . . . Warmest Christmas wishes to all.—**John P. Rich**, Box 503, Nashua, N.H. 03060

## 30

The gold star this month goes to **Tom O'Connor** for the completeness of the information form that he returned to me. Tom is President and Treasurer of Thomas O'Connor & Co., constructors of industrial buildings, power plants, civic buildings, hospitals, and schools. Among other projects, they are now building the largest high school complex in New England, a \$15,000,000 job in Medford, Mass. Tom is also President and Treasurer of the Beacon Piping Company and owner of Toframa Plantation which raises Santa Gertrudis beef cattle and tung trees.

Tom and Frances have four children and four grandchildren. Son (Tom, Jr., M.I.T., '60) is Vice President of Thomas O'Connor & Company and is on reserve status as a Major, U. S. Army Corps of Engineers. Daughter, Mary Elizabeth, is married to Constantino Ghini, Director of the International Institute, Loyola University, New Orleans, and Sister Frances R. O'Connor, Religious Congregation of the Sacred Heart, received an M.A. in philosophy from Manhattanville in '60, an M.A. in mathematics from Catholic University of America. She is presently studying in Rome. Eleanor Anne, aged 14, attends Country Day School of the Sacred Heart in Newton. Tom is a member of the Clover, Charles River Country and New York Athletic

Clubs, as well as of the Boston and N.Y. Engineers Clubs.

He reports having recently seen **Leslie Engler**, who is an executive at City College of New York and **Charles "Andy" Anderson**, who is a Consulting Design Engineer and a Professor at Wentworth Institute in Boston. Of special interest to your secretary was the incidental information that Tom has opened a branch office in Mamaroneck. Upon consulting the local telephone directory, I find that along the line of flight of the proverbial crow, Tom's new office is only half a mile from my home. How about stopping in to say hello some time, Tom?

**Beverly Ottaway** is a Civil Engineer with the Massachusetts Department of Public Works, assigned to the Construction Engineer's Office. The Ottaway's daughter, Judith, is married, lives in Clinton, Conn., and has three children. Bev has been Secretary of the Wellesley Planning Board for six years and a member of the town meeting for 10 years. He has also been tenor soloist at the Plymouth Congregational Church in Belmont for nearly 20 years and sings with the Masonic Consistory Choir and Aleppo Temple Chanters.

**Tom Hickey** has been appointed one of the 16 Group Directors of the examining groups in the U. S. Patent Office. . . . Secretary of Defense Clifford recently presented **Harry Poole** with a medal and citation for outstanding service as director of construction in the office of the department comptroller. During W.W. II, Harry, as a naval officer, worked with Lord Mountbatten in the South Pacific and as logistics officer on Admiral Halsey's staff in planning an invasion of Japan.

**Bill Dickerman** has received a certificate of appreciation for his work as N.Y. Class Chairman of the 1968 Alumni Fund. . . . At the Alumni Officers' Conference in September, **Greg Smith** received the 1968 Bronze Beaver. According to the citation, "His accomplishment, as President of the Alumni Association in 1967-68, will be a lasting source of strength and inspiration for the Association and its staff and for the institution to which it is pledged."

Changes of address: **Edward G. Giroux**, Orchard Hill Farm, W. Baldwin, Maine 04091; **Elias Klein**, Vanderbijl Engr. Corporation, Ltd., Box 9442, Johannesburg, South Africa; **Robert A. Poisson**, P. O. Box 88, Essex, Conn. 06426; Reverend **Vincent I. Thormin**, Goodwood, Ontario, Canada.—**Gordon K. Lister**, Secretary, 530 Fifth Avenue, New York, N.Y. 10036

## 31

A recent letter from **Myrle Perkins** tells that he has recently accepted an assignment from Bechtel International Limited which will take him to London. Perk

plans to settle in the center of London, convenient to the Bechtel office. He and Fran are both looking forward to this exciting and new assignment which will entail a considerable amount of travel on the Continent. During a recent ham radio contact with Colonel **Fred Elser**, Fred mentioned that he has decided to sell their large house, now that the children are away, and move into something smaller.

New addresses received include: **Henry E. Baratta**, Bell Telephone Laboratory, Whippany Road, Whippany, N.J. 07981; **Edward F. Coy**, Apartment 4, 12521 Camus Lane, Garden Grove, Calif. 92641; **Parker S. Dunn**, Kerr-McGee Corporation, Kerr-McGee Building, Oklahoma City, Okla. 73102; Major General **Robert J. Fleming, Jr.**, 99 Bayview Drive, Swampscott, Maine 01907; Professor **John L. Reid**, 1019 Market Street, San Francisco, Calif. 94103 and **Wallace B. Tibbets**, 26541 Hempstead Court, Sun City, Calif. 92381.—**Edwin S. Worden**, Secretary, 35 Minute Man Hill, Westport, Conn. 06880

## 32

An important milestone in the life of **Arthur M. Marshall** is the formation of the law firm of Marshall and Marshall in partnership with his son, David M. Marshall. Both Arthur and his son have been engaged in extensive practice before the National Labor Relations Board, the Massachusetts Labor Relations Commission, and the Interstate Commerce Commission. The new firm will practice general law with emphasis in the labor relations and labor law, municipal, corporate and transportation law and general litigation.

Faculty appointments for the 1968-69 academic year at PMC Colleges, Chester, Pennsylvania, include that of **Francis S. Chambers, Jr.**, as lecturer in engineering. Francis is Process Manager of the explosives department of E. I. duPont de Nemours Company.

A further note on **John F. Crowther's** appointment as projects manager for the Chemetron Chemicals Division of the Chemetron Corporation, Chicago. He will be responsible for coordination of programs aimed at expanding the firm's chemical activities. He joined Chemetron in 1964 after 19 years of experience in management positions with chemical firms. . . . **Bernard S. Gould**, Professor of Bio-Chemistry at M.I.T., was speaker of the evening for the installation of officers of the Temple Beth El, Lowell Hebrew Community Center. In addition to his scholarly attainments, Bernard has long been active in community activities in Boston and Brookline. He is presently a Trustee and Chairman of the Committee on Jewish Education and Culture of the Combined Jewish Philanthropies of Boston, a Vice President of the Hebrew Teacher's College of Boston, and Chairman of the School Board of the Congregation Kehillath Israel.

**Charles B. McCoy**, the President of the duPont Company, has been named a Director of First National City Bank of New York. . . . **Lawrence Berk** who started the Berklee School of Music in Boston in 1945 says that it grew out of the sheer force of enthusiasm. Today the school is accredited as a liberal arts college and also offers diplomas to those interested strictly in music. Lawrence believes that a change is necessary if jazz is to survive, and students are working to give jazz more popular appeal by replacing ultra-sophisticated sounds with a simpler harmonic content, a swing beat, and sometimes, even a tune. . . . Professor **Rolf Eliassen** has been working in Washington, D. C., as consultant to Dr. Hornig, the President's Science Advisor on environmental pollution, during his sabbatical leave from Stanford University.

Your Secretary has received notification of the deaths of four classmates earlier this year: **Wilmot H. Kidd**, Frazier Pasture Road, Ogunquit, Maine, on March 16, 1968, survived by his wife; **George R. Green**, 29 Rockland Circle, Brockton, Mass., on May 29, 1968, survived by his wife; **Swanton D. Dalton**, 115 Majors Street, Santa Cruz, Calif., on July 2, 1968, information received from his daughter; **Charles K. (Ken) Jones**, 27 Lantern Lane, South Duxbury, Mass., on September 11, 1968.

For many years **Jim Harper** has provided this column with news of classmates with whom he made personal contact while traveling on active duty with the U.S. Army. Jim is now Colonel U.S. Army Retired, but is still in Washington, D.C., in a civil service engineering position. He has agreed to serve as Assistant Secretary of the Class of '32 and have his address listed below so you can reach him when in his territory. We suspect that more of you travel to Washington than to Boston these days, and we hope you will take a moment to use this added open channel to relay news of yourselves to the whole class.—  
**Elwood W. Schafer**, Secretary, Room 13-2145, M.I.T., Cambridge, Mass. 02139;  
**James E. Harper**, Assistant Secretary, 2700 South Grant Street, Arlington, Va. 22202

## 33

Having sent in the class news for the October-November issue quite some time ago, and having mailed a rather long class letter only this week (October 6), our accumulation of news for the December issue looks and is rather sketchy. Just to refresh our memories, we have three major sources of class news: press clippings, Alumni Fund capsule news, and, personal correspondence from individuals. Brenda has cautioned me about inventing news just to fill up the column; so!! This time around, the press pile is light indeed; no Alumni Fund capsules; and almost no news from individuals. Make no mistake, men, over all twelve months, we do really well; my

complaints thereby lose a lot of sting. **Bob Winters** makes the news again as he becomes a Director of Alcan Aluminium Ltd. I am never sure that I am not repeating myself when I write about Bob, as he has a finger in so many things. In this case I find it better to make a small mention, rather than be scolded for leaving something out. More seriously, Bob, we are all with you, and are happy to be classmates of such a distinguished and lovable character; again, our best wishes.

A quickie about **Walter J. Haring's** having been made a Vice President of Tishman Realty and Construction Company, Inc. It makes me wonder if Walter really has been a member of the Tishman staff since 1932, when we consider that he got his degree in 1933, and, jobs were scarcer than bows by the lions in front of the New York City Public Library, 40th and Fifth Avenue. So, again, our very best, Walt, and please set me straight on that job start.

We occasionally receive the *News Report* from the National Academy of Engineering (along with the National Academy of Sciences, and the National Research Council), and, there is always mention of M.I.T. men. But, the last issue to reach us had mentions of many M.I.T. men, even further, three '33 Institute men are mentioned as being elected to membership, out of a total of 50 over the entire country. A little cogitation might reveal the astronomical chances against any one school achieving three memberships at any one time, so, added to this our class has three: **Ivan Getting**, President of Aerospace Corporation; **Ralph E. Cross**, President of the Cross Company of Fraser, Mich., and **Philip C. Rutledge**, partner in Meuser, Rutledge, Wentworth and Johnson, of New York City. Unfortunately, the *News Report* goes into little detail on the backgrounds of these new members, so we cannot add too much. While Ivan and Ralph are not newcomers to these pages, Phil Rutledge is, and we implore Phil to send us, post haste, HIS background material, however scanty; Haw!! Does anyone wish to comment on how a man is selected for membership in the National Academy with a scanty background? Its your turn, Phil, and we await your story with interest; to all three our most sincere congratulations. We are proud to know such fine, and capable folks.

Circuit Foil Corp., of Bordentown, N.J., announces that one John Thorp was recently elected Director of the firm, succeeding **Samuel Lieben**, who did not stand for re-election. John Thorp may be one and the same as our own John, Class of 1935, but, Sam Lieben surely is a '33 man. As I read the clipping, something caused me to look up Sam's address card, and I found the absolute minimum of information on this character. To explain: all the cards carry names, addresses, course (or courses) while a student, degree or degrees, if any, and further, my own code (secret). I am writing to Sam right away to ask for his



Miss MITRE admired by Bill Kilbourne, '33 (left).

address, complete with Zip code, and all the rest of the information to which I am entitled. Sam, if you have not replied to me before reading this, won't you come through now?

In a former column, I mentioned a July trip to southwestern Montana on a planned, escorted pilgrimage to this great commercial cattle country. Along the way I was detained, got somewhat behind the main automobile caravan, and missed lunch at one of the big ranches. I picked up a lunch at a wayside inn, the Diamond Bar Inn, named for the owner of a nearby ranch. The small placemats picturing mountain country scenes were designed to fold into a letter for mailing. I got 25 and mailed them to 24 classmates. This resulted in my uncovering a man who did not know that I was the 1933 Class Secretary (he must not read the *Review*). He wrote his reply to me, which is greatly appreciated, addressed to the Diamond Bar Inn, Jackson, Mont. The classmate's name — **David Walker Lee**, of Bloomfield Hills, Mich. (Please, Dave, do not mistake my motive for mentioning this.) Dave is, to date, the only one who replied to that card. I usually send 25 cards and the average reply list is three. This time, however, Dave's reply is well worth being the only one, as he really sends his best. He is in his 23rd year with Ford Motor Company and has had a great variety of technical and marketing assignments, mostly with Ford trucks. Currently, he is Advertising Manager for trucks, Ford Division of Ford Motor Company. The ink had not yet dried on Dave's sheepskin when he married Frances Bone of Topeka, Kansas. They spent just a few months in Manhattan, then to Detroit they went and have stayed. The Lees have two sons, now 29 and 26, and one grandson. Well, Dave, one grandson lets you into the Club, but it is just a foot in the door.

The Lees, it says here, have no serious hobbies, excepting travel, and Dave enjoys the use of a good still camera.



In fact the next trip will be a safari in Africa, with camera, I do hope and expect. Now, I must quote, "How's that for packing 35 years into a few paragraphs?" And, here is a promise; he will write to me or my successor when he makes up his mind to retire. Brother, he writes once in 35 years, and will do so again, with one reservation. Whatta man! No fooling, Dave, I may sound off a bit, but, I do appreciate hearing from you, and I venture one suggestion. Send me a card from Africa! We have two classmates in South Africa, and I have heard from both, so you, my friend, are next. Further, you Lees went to Detroit in 1933, and have been with Ford for 23 years. Where went the other 12 years? I will wait. Please see the address at the end of this column.

Golly, I almost missed one of my precious press clips; this on one of our more recent whipping boys, air pollution. It seems that the Commissioner of the National Air Pollution Control Administration has appointed a Committee of 12 on pollution control techniques, advisory to the N.A.P.C.A. Ain't it surprising the way those five letters may be rearranged? And, '33 makes it again, as **Louis D. Alpert** has been asked to be a member of the committee. Louis is General Manager of the Midwestern Department of the Federated Metals Division, American Smelting and Refining Company, Whiting, Ind. Louis took his bachelors degree with us, and remained another year for his masters. Could it be that this committee can take the place of **Dick Morse's** committee in exactly the same field? Gee, I miss those monthly releases of Dick's. His committee was set up for the purpose of abolishing the internal combustion motor, or something, and, more than 50 per cent of the committee were automobile executives. Now comes another, with similar motives, and set up about the same way. Of the 12, two are college professors, four more are in public health work, and the remaining six might be called "polluturs;" rather like making the prisoner punish himself. This is not quite as literal as it sounds as the Committee's work will be with determination of pollutants in any and all areas where air pollution is a problem, assembling of the data, and combining pollution control efforts in areas where two or more populations are close enough together to make it advisable to treat them as one unit. M.I.T. has another alumnus on the committee; a professor from the University of Washington. Atta boy, Louis! And, I don't remember seeing you at the 35th.

We have several cards from Europe, one from **Bill Baur** and the other from **Walt Skees**. Bill is on his terminal leave from General Electric, having retired from active duty on September 1. The Baur's are visiting Spain, where son Buar, an Air Force officer, is located. They have finished the family visit and are now doing some travelling, having stopped first at Spain's Islands, the Balearics. Bill mentions staying in Majorca, and the

card is one of Mallorca; a prettier spot is hard to imagine.

Bill and Mrs. Baur will visit Switzerland, Austria, France and Germany, before returning to U.S. retirement. Bill told me at the 35th that he and his lady are pointing this foreign trip right at the place in Germany from whence they both came, many years ago. By hook or crook, they were able to get out of Nazi Deutschland ahead of the crises that came later. In fact Bill got his degree in Cambridge the same year as the Munich Putsch. However, it has been my impression that they both learned their English while still in Germany and have retained their accent after all these years. They hope to spend a month or more at the town of their birth, as well as to do some travelling in Germany. What a grand feeling it must be. I try to imagine my own feelings under similar circumstances, and it is easy to imagine the feelings of this nice couple.

Another foreign card, this one also from Barcelona, Spain. **Walt Skees** sent his annual greetings, "sezsee." That's all he said on the card. He even carries his signature stamp (rubber) with him, to save writing his name. If I didn't know this guy, I'd be shocked. For the information of the ready made uninformed group, Walt is a former professional engineer and also formerly from Miami. He moved to the Bahamas and now sells real estate, or at least he has it for sale. Perhaps **Ellis Littmann** can help us with this one. Ellis sees Walt every winter, I expect, as he likes to "take the kids" for a little sun in the cold weather. This Walt really likes the warm weather, what with his home in the Bahamas and taking in Barcelona in August. That gets too close to someone's idea of the hereafter along about that time of the year. Thanks, Walt. You still do much better than half of our class, who never "write at all."

Here we have a short one from **Newt Buerger**, formerly of the Naval Post Graduate School at Monterey, Calif. Newt is retired, as we told you a year ago, and is in consulting work for Viking Metallurgical Corporation, which he still finds interesting and exciting. Now, men, especially you golfers, here's the punch line. Newt says, "We still have not sold the Pebble Beach house, but hope to any day now." Egad! No matter what one pays for a home on that golf course, he never gets took; a really marvelous spot. I dang near chose it for myself in 1948, or was it earlier. If anyone wants in, drop me a line and I'll give you Newt's address. Thanks, Newt; your card was and is most welcome.

I had a nice note from **Mal Mayer** in which he asked for the names of classmates in Australia, South Africa, and England. He and the lovely Mrs. Mayer are taking off once more on a beer inspection trip, or whatever he does in these beer powwows. It seems that we have no classmates in Australia, but

have two in South Africa, and one in England. I tried to contact our classmate in England myself, and had no luck. Mal, however is more resourceful and determined than I, so he may make it. Mal inserts a thoughtful idea, one which has not occurred to me as such: "I do expect that something will be said in the Notes to congratulate and thank the Committee for the splendid time we had at the 35th, and I want to add our specific thanks to you for your outstanding performance, and contribution to the wonderful time we had—and you can print this." Thanks, friend, but, I do not recall doing very much except taking pictures. As Mal said, the committee did the work and they get credit for such as is forthcoming.

We have one more short one, this from **Ellis Littmann**. He sends me a copy of a letter from Mal Mayer, which tells about the same as the above, but to Ellis. Thanks Ellis. You did not know that Mal had written me, so that makes you a real Veep. One item worth something; Ellis saw **Adam Sysko**, at the Alumni Officers' Conference, and I didn't. I looked for him but missed him altogether. And, while I think of it; our Class was quite well represented by **Adam Sysko**, **John Westy Westaway**, **Bill Barbour**, **John Longley**, **Ellis Littmann**, **Calvin Mohr**, **John Wiley** and, Ye Secretary. I missed several sections of the conference myself, as I had some eyeglass trouble (stepped on them with sad results). This caused intermittent headaches, and hence loss of time. Strange, to say the headache disappeared at the cocktail party. Ellis reports that he, too, saw nothing of **Cal Mohr**. Let's wait for this excuse. It had better be better than the shingles. Thanks Ellis, and best to Roz for us both.

It is now time to name a few names on Reunion snapshots, or, better still, ask you fellows to name yourselves. We can't ask the *Review* to list 30 odd men who neglected to get photoed at the 35th. We want each of you to furnish us with snaps, if we do not already have one. It is presumed that the whole album will be ready for display at the 40th, so, you can save me some time and money if you will send in a photo of yourself, reasonably current. I will be writing to a few of you, later, who did have your picture taken but for whom we can't seem to get any accurate identification. So, if you were snapped, and I write for another, please tell me and I will send you what I have and you can pick out your own photo.

We have a few changes of address which are available upon written request. **Harold J. Baker**, **Edward S. Goodridge**, **Wolfgang M. Kloenne**, **Roger L. Putney**, **Lawrence C. Kingsland**, **William L. Sheppard**, and, a brand new classmate, **Thomas M. Hayden**, who, it says here, has been transferred to 1933 from 1934. I will suppose that it is gratifying for Tom to be moved into the Roster of one of the better classes. I have written Tom for details, and this kind of gossip tends to be juicy, betimes.

We note that **Wolfie Kloeene** has moved 4 times in as many years (South Africa only), so it appears that this moving does save paying rent. We further note that after all these years our Class Marshall, **Edward S. Goodridge**, has finally given up on Scarsdale. I could get a bit dirty on this one, too, but, to be honest, Ed does have all his business interests tied up in Connecticut, now, and the commuting in the wrong direction must become confusing. If I hear where Goodridge lives, I will tell you all when's the housewarming.

Besides **Harry Bell**, whose passing was mentioned in the interim letter, we have two more of our good friends, who have passed to their reward; Dr. **Gordon C. Pratt**, and **Frank S. Coyle**. Dr. Pratt was a Course VII graduate and took that degree with us. He went on for his medical degree at the University of Chicago and then practiced in Longmeadow, Mass., until 1962, when he was appointed Director of Student Health at Ferris Institute, Big Rapids, Mich. He was Visiting Physician at Springfield Hospital, and a member of the Courtesy Staff at Wesson Memorial Hospital. Gordon is survived by his widow, Marjorie, and, three daughters. I am sure that you all would join me in extending the sympathy of the entire Class of 1933 to Gordon's loved ones. **Frank S. Coyle** passed on late in August, at his home in New Orleans. I had a very nice letter from his sister, telling me of Frank's passing, and, it never did occur to me that Frank was not married. I met him just once in New York City before he went south and there was no wife at that time. Perhaps some of you know if Frank ever did marry. I kept in touch with Frank, especially when he was moving around while working with the George A. Fuller Company, Inc. Frank was Course II, but I did not know him until we met much later. Miss Anna, your brother's Class at M.I.T. all join me in sending you our sympathy and best wishes.

Fellows, it is not too early to send in your reservations for the Mexico City M.I.T. Club Fiesta, which comes in March, or at least, has. The Class of 1921 uses this Fiesta as the mid-winter and reunion vacation every year, and I am proud and envious of all that gang of great guys (and dolls). It is truly a great time; three days of most interesting and enjoyable visits around town, and then a Mexican Evening at the lovely home of "Nish" and Luisa Cornish, '24; an evening that one will just NEVER forget. Nish is a handsome, white-haired chap who looks older than I am, but ain't. Luisa is one of the loveliest little bitsy Mexican senoras extant. This event is M.I.T. with a bang, and an annual visit to Mexico would be great. Why not write me for details so I can get your name on the mailing list, which is not too big but is quite impressive and select. That's it this time around, folks, so we must say "vaya con dios," and, as this is the December issue—A very merry Christmas to all 1933, also to Brenda,

John, and all the great bunch of folks in the Alumni Office.—**Warren J. Henderson**, Secretary, Fort Rock Farm, Drawer H, Exeter, N. H. 03833

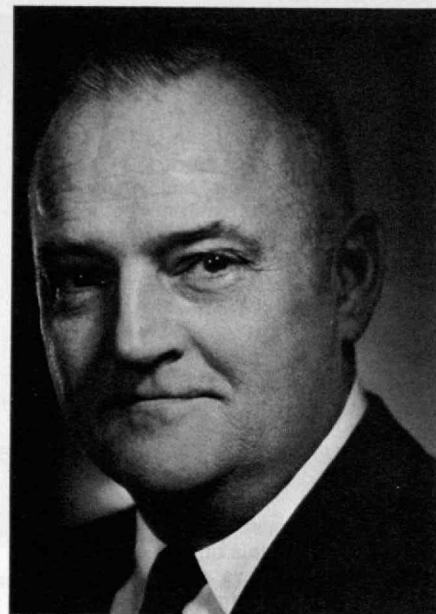
Editor's Note: Mr. Henderson informs us of the passing of **Edward S. Goodridge**, Saturday, October 12, while taking a late afternoon nap. Details later.

## 34

**Karl Gardner** has sent a good resume of all his activities since graduation. He has become a recognized authority on heat transfer and has recently become Senior Consultant to Robert W. Dickinson, Director of the Liquid Metal Engineering Center, which is operated at the Santa Susanna Nuclear Field Laboratory of the Atomic Energy Commission. Prior to that he was with M. W. Kellogg, as a Senior Staff Consultant and lecturer at Stanford University in the graduate school of mechanical engineering. Prior to that, he lectured in the school of chemical engineering at the University of Delaware. He has also been Chief Engineer of the Griscom-Russell Company and was, for a time, an engineer with the Cities Service Company. Karl, after Tech, did graduate work at Columbia and at New York University.

He has been active in professional societies and received the American Society of Mechanical Engineers Heat Transfer Division Memorial Award for contributions to the technology of heat exchanger design. Karl's son, Karl W., graduated in the Class of 1968, making it three generations in a row for the family. Karl has a daughter, Kay, who attended the School of Music at the University of Michigan, and is now married to the Manager of the Norfolk, Va., symphony. They have two daughters, ages six and four.

A letter from **Neil Putnam** gives us some interesting facts about his family which now consists of three children, two of which are married and have two children each. A third child is in college in Florida where he is making his home. Neil married in 1934, after spending several months at sea. From 1935 to 1966, he was with Improved Machinery Incorporated. This was interrupted by three years service with the Navy from 1943 to 1946. After returning to Improved Machinery in 1946, he continued his career there, retiring as a Vice President in 1966. After some odd jobs in Florida, he bought Casey Key Marina at Sarasota, in 1968. This now keeps him busy 10 hours a day, seven days a week, so busy that he is moving out of his retirement home to a place on Casey Key. In addition, Neil has been busy with church work and similar organizations. He appears to be enjoying life, but the Marina keeps him so busy that he does not have time for his favorite sport, sailing.—**George G. Bull**, Assistant Secretary, Mid-Atlantic, 4961 Allan Road, Washington, D.C. 20016; **James Eder**, Secretary, 1 Lockwood Road, Riverside,



*Charles H. Schauer, '35*

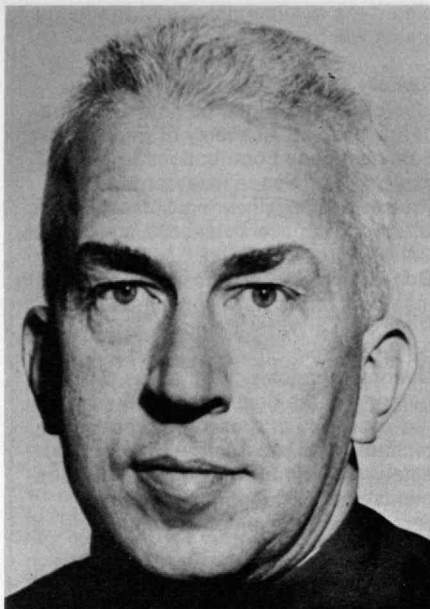
Conn. 06878; **W. Olmstead Wright**, Secretary, 1003 Howard Street, Wheaton, Ill. 60187; **Norman B. Krim**, Secretary, 15 Fox Lane, Newton Centre, Mass. 02159

## 35

This month we have many personnel promotions to report. **John Bainbridge** has been appointed Eastern Regional Sales Manager for Penick & Ford Ltd., Cedar Rapids, Iowa. **Walter H. Stockmayer** was elected 1968 Chairman of the American Chemical Society's Division of Polymer Chemistry. **Edward Woll**, Military Division, Aircraft Engine Group, Lynn, Mass., was elected Vice President of the General Electric Company. **Charles H. Schauer**, formerly Vice President and Secretary, was elected to the Board of Directors and to the post of Executive Vice President at Research Corporation, New York. **John Thorpe** was elected a Director of Circuit Foil Corporation, Bordentown, N.J. **Robert W. Spinney** received a Master of Education degree from Rutgers this year. **Robert F. Flood**, Vice President of Union Carbide Corporation, was appointed to the Board of Directors of the Transportation Association of America. **Alfred McDonald** has been appointed Assistant to the General Manager of Bethlehem Steel Corporation's Sparrows Point Shipyard.

**Richard H. Cook**, who joined The Foxboro Company in 1942 and was previously their manager of special products engineering, has been promoted to manager of the newly formed Order Processing Department which will be responsible for the entry, scheduling, documentation and other necessary functions in support of the company's analog business. . . . The backs of the Alumni Fund donation envelopes brought in the following notes of interest: **Richard F. Jarrell**: "Jarrell-Ash Company, the company





William G. Guindon, S.J., '38

started by my father that I have managed since 1944, has just merged with Fisher Scientific Company of Pittsburgh. Fisher will sell the Jarrell-Ash Division's less expensive instruments while our specialized salesmen continue to sell the more sophisticated spectroscopic equipment. The merger is keeping me busy." . . . **John S. Holley**: "Please excuse penmanship. Wife doesn't want me using typewriter due to convalescing from heart attack (my first). I still plan on living to 100 and going dancing New Year's Eve year 2000. Good living in Imperial Beach (most southwest city in continental United States) due to fabulous entertainment in San Diego area and proximity to Tijuana. Any classmate visiting, especially if with family, invited to contact for grand tour of area. New hobbies since last letter are rock hounding, cactus and succulent horticulture, square dancing, fishing, and holding garage sales. Job is now honorable, lowly GS-12 in civil service electronics-engineering. Please visit if possible."

**Samuel Paul**: "Authored a book recently published by Reinhold Publishing Company entitled *Apartments—Their Design and Development*." . . . Colonel **Charles K. Allen**: "Registered professional engineer State of New York." . . . **Thomas C. Donahue**: Retired as Captain C.E.C., U.S.N.R. and Civil Engineer Navy Facilities Engineering Command. Presently, business development at Dewberry, Nealon & Davis, consulting engineers, Fairfax, Va." . . . **John D. DuRoss**: "The DuRoss' are grandparents of three, the last two being twin sons born in November 1967 to my oldest son and his wife, the Reverend and Mrs. Ernest S. DuRoss. My oldest son is the curate at St. Barnabas Episcopal Church, Bay Village, Ohio, and my youngest son will complete his junior year at Hillsdale College."

**W. Whitney Stueck**: "Still doing business at the same old stand. Son, Arthur, recently out of Air Force, has joined

me." . . . **George C. Dunlap**: "We have a new granddaughter, Laura Anne, born to our son Robert, '67, and wife Elizabeth. Robert is now at Cal Tech for masters degree in aeronautical and astronautical science and engineering." . . . Nine members of our class attended the 1968 National M.I.T. Alumni Officers' Conference in Cambridge on September 6th and 7th. Registrants included **Bill Abramowitz**, **Randy Antonsen**, **Rufus Applegarth**, **Nix Dangel**, **Charlie Debes**, **Carbon Dubbs**, **Pete Grant**, **Wes Loomis**, and **Bernie Nelson**.

We received a sad note from Jeannette Chapman telling us that her husband, **John Chapman** had passed away suddenly on July 16. He is survived by a son, John, who is serving with the Armed Forces in Germany, a daughter, Jane Chapman McAlister, and one grandchild, besides his wife. . . . In September, **Faustino (Andy) Andreoli** died. He was Vice President and Treasurer of Harding & Gross, a Cambridge engineering firm. Surviving are his wife, Mary, a daughter, Mrs. Herbert Wood, his mother, two brothers and a sister.—**Phoenix N. Dangel**, Co-secretary, 329 Park Street, West Roxbury, Mass. 02132; **Irving S. Banquer**, Co-secretary, 20 Gordon Road, Waban, Mass. 02168

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Last June I received in the mail the '37 table marker used at the Alumni Banquet on Alumni Day which informed me that we were represented at this affair by **John B. Nugent**. . . . **Bill Hartmann** of Chicago has been elected to the Corporation, which is the governing body of the Institute. . . . **George Weppler**, President of Harvey Hubbell, has been elected to the additional position of Chairman of the Board. George joined the electrical equipment manufacturer in 1955. He was elected president in 1963. Prior to joining Hubbell, he was associated with L. E. Waterman Company, and Metal and Thermit Corporation, both of New York City, and Johnson and Johnson, New Brunswick, N.J. . . . **Wally Wojtczak** represented the Institute at the inauguration of Theodore David Lockwood as the fifteenth President of Trinity College. . . . **Alan L. Kling**, loss prevention consultant for Olin Mathieson, is now also safety consultant for Society of the Plastics Industry, Inc.

**Joe Keithley** is the founder and President of Keithley Instruments Inc., Cleveland, Ohio, which has grown from a modest, one-man operation to a nearly 5 million per year business mostly during the last ten years. . . . **Charles E. Reed** has been named Vice President and group executive of a newly formed Components and Materials Group of the General Electric Company, Bridgeport, Conn. . . . **Al Reinhardt** of West Hartford, Conn., has been appointed chief project engineer in the precision mechanical products department of Hamilton Standard Division of United Aircraft Corporation. Al held several engineering positions

before he was appointed senior project engineer for the Boeing 747 environmental control system in 1965.—**Robert H. Thorson**, Secretary, 506 Riverside Avenue, Medford, Mass. 02155. **Prof. Curtiss Powell**, Assistant Secretary, Room 5-325, M.I.T. Cambridge, Mass. 02142. **Jerome Salny**, Assistant Secretary, Egbert Hill, Morristown, N.J.

## 38

Have you ever tried to write news in the beginning of October to be printed in December? That's my problem right now. I'll sock it to you and wish you a Merry Christmas, too.

I attended the Alumni Officers' Conference in Cambridge in September, along with a stellar group from '38—**Frank** and **Ruth Kemp**, **Don** and **Phyl Severance**, **Chet Lawrence**, **J. J. Phillips**, and, in from the West Coast, the Hughes Aircraft Bobsey Twins—**Hal Strauss** and **Ben Thompson**. Ben incidentally, has in his garage a functioning Wurlitzer movie organ. He trucked it in from the Midwest, installed it, and by gosh, it works (much to the shock and horror of his neighbors)! J. J. is President of the Washington, D. C., M.I.T. Club, and is a Registered Representative, selling Mutual Funds.

The entering Class of 1972 is well represented by '38 parents—**Y. T. Li**, currently a Professor at M.I.T., has Winifred I. Li; **Howie Schlansker's** son, Howard, Jr.; **Ralph Slutz's** son, Robert; and **Alvin Welling's** son, Peter.

**Lloyd Clark**, who is a partner in Clark and Groff Engineers, Inc., consulting engineers in Salem, Ore., has been elected National Vice President of Consulting Engineers Council of the U.S. **John Crichton** writes that he is President of Crichton & Company, which is a petroleum consulting and management firm engaged in domestic and overseas operations, with particular emphasis on Europe and the Middle East. . . . **Justin Francis** wrote a note: "My daughter, Joyce Francis Grunwell, and my son-in-law, John R. Grunwell, III, both received their Ph.D.'s from M.I.T. on June 7th." This reminded me that my own daughter-in-law, now Lynn Wiesenberger Bruneau, '68, received her B.S. from M.I.T. on that same date. **Bill Gibson** reports: "Still working for Ph.D. in economics at American University. Selling Mutual Funds with B.C. Morton Organization (home office Boston); Commander of Coast Guard Auxiliary Flotilla 24; and trying to enjoy my retirement."

**Art Gould** has been named Alcoa Industrial Engineering Professor at Lehigh. Art is Chairman of the Department of Industrial Engineering, and, last May was elected National Chairman of the National Council of Industrial Engineering Department Heads of U.S. Colleges. . . . A newspaper clipping was belatedly forwarded to me that **Cliff Graves** died of pneumonia in New York on April 29,

leaving his widow, Ann. . . . The Rev. **William Guindon**, who was in the Class as a freshman and sophomore, and is presently Vice President and Dean of Holy Cross, was appointed Father Provincial of the New England Province of the Society of Jesus.

**Arnie Kaulakis** was elected President of Airco-BOC Cryogenic Plants Corporation in Murray Hill, N.J. This is a joint venture between Air Reduction Company and British Oxygen. . . . **Bruce Old** was elected a member of the National Academy of Engineering. Bruce is a Senior Vice President of Arthur D. Little, Inc., in Cambridge. . . . **Bob Park** was appointed Senior Representative, Texaco Development Corporation, Houston, Texas. . . . **Al Wagner** reports that he is a Service Engineer with the Commercial Publications Division of the Boeing Company at Reutem, Wash., if I can read his writing correctly.

Your scribe attended another first in October—a cocktail party at the Whitney Museum, put on by the New York M.I.T. Center. Our Class was represented by: **Howard** and **Hope Milius**, **Frank** and **Ruth Kemp**, **Don** and **Phyl Severance**, and **Roy** and **Alice Hopgood**.—**Armand L. Bruneau, Jr.**, 550 Broad Street, Newark, N.J. 07102

## 39

In the October/November notes you learned that **Wesley A. Kuhr**, XVI, had been appointed Executive Vice President of Sikorsky Aircraft. In this issue comes the follow-up that he was elected president of United Aircraft's Sikorsky division, in October. My first news of Wes' promotion came from Philip B. Walker, Secretary-Treasurer, '07, who sent a clipping and added the note that Wes is playing a very important part in the development of air travel of the future. Incidentally, his new home address is 139 Silver Hill Road, Easton, Connecticut. . . . **Harlow J. Reed**, XIV, was appointed in August as chief operating officer of Olin Mathieson Chemical Corporation. That is a new position for Olin, and Harlow retains his existing title of Executive Vice President.

**David E. Morgan**, III, President of Peerless Precision Corporation of Pawtucket, Rhode Island, was recently elected a Director of Royal School Laboratories, of Richmond, Va., **Francis A. Obert**, VII, is now a Vice President of Metcalf & Eddy, one of the leading engineering consulting firms in the United States.

**C. Philip Epifano**, XVII, Vice President of the E. and F. Construction Company of Bridgeport, Conn., is serving as a Trustee of the Mechanics & Farmers Savings Bank, of Bridgeport. Phil is also an Adviser at the North End Branch of City Trust Company, and is a Trustee of Park City Hospital.

Here's a debatable item to be writing about (mid-October) prior to the Novem-

ber elections, but the Boston *Evening Globe* on September 13 carried a front-page feature story speculating on the future political possibilities of Lieutenant Governor **Francis W. Sargent**, IV, of Massachusetts. The *Globe* was favorably describing Frank's current planning activities looking forward to the possibility of becoming governor if Nixon becomes President and takes Massachusetts' Governor Volpe into his Cabinet.

From the Review office came the congratulatory news that two '39ers have freshman sons at M.I.T.: **Morgan C. Y. Sze, X**, (Manager of Lummus Company's Engineering Development Center, in Newark, N.J.) whose son Arthur entered this year, and **Arthur W. Vogeley**, XVI, (Head of Guidance & Control Branch, NASA Langley Research Center, Hampton, Va.) whose son Arthur, Jr., also entered this year's Freshman class.

Two deaths are regretfully to be reported. **Eugene J. Mackey**, IV, 6124 Enright Street, St. Louis, Mo. 63124, died on July 27. He was listed in the 1967 Alumni Register as Partner, Murphy & Mackey Architects, St. Louis. **Philip Lucas**, V, 41 Sherman Road, Brookline, Mass. 02402, died on July 19. The Register listed him as Division Manager of Chemical Product Development, Gillette Safety Razor Company, Boston.

Keep on the alert for news of our upcoming 30th Reunion. **Ernie Kaswell** is Chairman. Wychmere Harbor Club, Harwichport is the place. Ernie's address is 67 Paulson Road, Waban, Mass. 02168; I know from past experience that he will appreciate ideas, assistance, and contributions in kind and in money!—**Oswald Stewart**, Secretary, 3395 Green Meadow Circle, Bethlehem, Pa. 18017

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Among students entering the Class of 1973 is Benjamin W. Wilson, son of our own **Dick Wilson**. Dick's older son, Alexander, graduated in the Class of '67.

At the Alumni Officers' Conference, on September 6 and 7, our Class was represented by **Bruce Duffett**, **Robert Gould**, **Walter Hess**, **John Joseph**, **William Peck**, **Richard Robertson**, **Louis Russoniello** and **Martin Abkowitz**. This information was passed on to me by **Paul Robinson**, Secretary of the Class of '44. . . . **Frank Penn**, our former Class President, was one of the members of the Fund Board in the record breaking 1967-1968 M.I.T. Alumni Fund campaign. Get your contributions in now to break that record this coming year.

**Edward Josephson** commented on the recent F.D.A. decision to eliminate irradiated bacon from the Army and Air Force diet. Ed pointed out that, to show the safety of irradiated ham, the Army will conduct experiments with four generations of weaned rats and it will take two years. Until such studies are com-

pleted the commercial use of irradiated meats will be held up.

**Samuel Silver** was honored by being elected as one of the 50 new members of the National Academy of Engineering. Sam has made contributions to radar systems, and space research and is Professor of Engineering Sciences and Director of Space Sciences Laboratories, University of California. . . . **Clark Goodman** has been chosen as one of the members of the new Committee of Radioactive Waste Disposal established by the Atomic Energy Commission and National Academy of Sciences. The purpose of the committee is to assess the adequacy of present and projected technology to meet long-range health, safety, and other environmental requirements and the identification of new research and development needs.

**Herb Hollomon** was formally sworn in as President of the University of Oklahoma on October 18. In his previous assignment he was acting Under Secretary of Commerce and previous to that was Assistant Secretary of Commerce for Science and Technology. . . . **I. M. Pei** is again in the news as the architect selected to design the addition to the National Gallery of Art in Washington, D.C. **Al Wu** has been elected to the Board of Trustees of Friends Academy, Locust Valley, Glen Cove. . . . **Jack Kyger** has been appointed to the new post of Vice President and Deputy General Manager of Avco's Space Systems Division. He has been an Avco executive since 1954, most recently as Vice President and Chief Scientist of the Company's Missiles, Space and Electronics group.

Your secretary, who has visited 46 of the 50 United States (and who hopes to get to the remaining 4 eventually), after being land-bound most of his life, has recently made two quick trips to Europe. His trip to Czechoslovakia was reported in last month's *Review*. This time he went to Frankfurt, Germany, but the two days spent there was hardly time enough to do any sightseeing or to practice his German, learned under Professor Wild Bill Hall.

For a number of months we have published changes in address for classmates, but have yet to receive any indication that these were found useful. If any members of the class indicate an interest in the renewal of this feature, we will be most happy to reinstate it. Whether you wish to write on this subject or any other, your letters or postcards are always most welcome.—**Alvin Gutttag**, Secretary, Cushman, Darby & Cushman, American Security Building, 730 15th Street, N.W., Washington, D.C. 20005



## FIFTH ANNUAL TOUR PROGRAM—1969

This unique program of tours is offered to alumni of Harvard, Yale, Princeton and M.I.T. and their families. The tours are based on special reduced air fares which offer savings of hundreds of dollars on air travel. The tour to India, for example, is based on a special fare, available only to groups and only in conjunction with a tour, which is almost \$400 less than the regular air fare. Special rates have also been obtained from hotels and sightseeing companies. Air travel is on regularly scheduled jet flights of major airlines.

The tour program covers four areas where those who might otherwise prefer to travel independently will find it advantageous to travel with a group. The itineraries have been carefully constructed to combine the freedom of individual travel with the convenience and saving of group travel. There is an avoidance of regimentation and an emphasis on leisure time, while a comprehensive program of sightseeing ensures a visit to all major points of interest. Hotel reservations are made as much as a year and a half in advance to ensure the finest in accommodations.

## THE ORIENT

30 DAYS \$1549

Mar. 22, Jun. 28, Jul. 26, Sept. 20

1969 will make the fifth consecutive year of operation for this fine tour, which offers the true highlights of the Orient at a sensible and realistic pace. Eleven days will be spent in JAPAN, divided between TOKYO, the ancient "classical" city of KYOTO, and the FUJI-HAKONE NATIONAL PARK, with excursions to NARA and NIKKO. Five days will be spent in HONG KONG and four in the fascinating city of BANGKOK. Shorter visits to SINGAPORE and the lovely island of FORMOSA complete the itinerary. Optional pre and post tour stops may be made in HONOLULU and the WEST COAST at no additional air fare.

A complete program of sightseeing will include all major points of scenic, cultural and historic interest. Features range from a tour of the canals and floating markets of Bangkok, an authentic Javanese "Rijst-tafel" in Singapore, and a launch tour of Hong Kong harbor at sunset, to a "Mongolian Barbecue" in Taipei, and a trip on the ultra-modern 125 m.p.h. express trains of Japan.

Tour dates have been chosen to coincide with outstanding seasonal attractions in Japan, such as the spring cherry blossoms, and beautiful autumn leaves, and some of the greatest annual festivals in the Far East. Total cost is \$1549 from California, \$1719 from Chicago, \$1787 from New York.\*

## INDIA

Including NEPAL and PERSIA

29 DAYS \$1636

Mar. 15, Mar. 22, Aug. 2, Oct. 4

An unusual opportunity to see the diverse and fascinating subcontinent of



India, together with the once-forbidden kingdom of Nepal and the rarely-seen splendors of ancient Persia. Here is India from the mighty Himalayas to the palm-fringed Bay of Bengal: the great seaport of BOMBAY; the magnificent cave temples of AJANTA and ELLORA, whose thousand year old frescoes are among the outstanding achievements of Indian art; MADRAS, in the south; the great industrial city of CALCUTTA; a thrilling flight into the Himalayas to KATHMANDU, capital of NEPAL, where ancient palaces and temples abound in a land still relatively untouched by modern civilization; the holy city of BENARES on the sacred River Ganges; AGRA, with not only the Taj Mahal, but many other celebrated monuments of the Moghul period such as the Agra Fort and the fabulous deserted city of Fatehpur Sikri; the walled "pink city" of JAIPUR with an elephant ride at nearby Amber Fort; the unique "lake city" of UDAIPUR, with its delicate white marble palaces; the great capital of NEW DELHI; and the fabled beauty of the VALE OF KASHMIR, surrounded by the snow-clad Himalayas. PERSIA (Iran) includes visits to PERSEPOLIS, the great royal capital of Darius and Xerxes in the 5th century B.C.; and ISHFAHAN, the fabled city of the 15th-17th century Persian Renaissance, with its palaces, gardens, bazaar, and famous tiled mosques. Outstanding accommodations include hotels that once were palaces of Maharajas and luxurious houseboats on Dal Lake in Kashmir. Total cost is \$1636 from New York.\*

## SOUTH AMERICA

31 DAYS \$1599

Jan. 18, Jul. 26, Oct. 18

An original itinerary which takes unusually full advantage of South America's great scenic and cultural attractions. The trip descends along the West Coast, dominated by the towering Andes and filled with the churches and mansions of 16th and 17th century Spain, and returns through the modern cities and lush scenery of the East Coast. Stops include Spanish colonial QUITO, with the nearby Indian market at AMBATO and a drive along the snow-capped peaks of "VOLCANO ALLEY"; Pizarro's great viceregal capital of LIMA; the ancient city of CUZCO and the fabulous "lost city" of MACHU PICCHU; lovely SANTIAGO in Chile; cosmopolitan BUENOS AIRES, the continent's largest city; BARILOCHE, in the beautiful ARGENTINE LAKE DISTRICT; spectacular IGUAU FALLS (largest in the world); the sun-drenched beaches of RIO DE JANEIRO (considered by many the most beautiful city in

the world); the quaint and historic town of OURO PRETO (so revered by Brazilians that the entire town is preserved by law as a national museum); the striking contemporary architecture of BRASILIA; and PANAMA CITY with the Panama Canal, Spanish ruins, and free-port shopping. These great points of interest are complemented by an assemblage of South America's truly outstanding hotels. Total cost is \$1599 from New York.\*

## EAST AFRICA

22 DAYS \$1549

Jul. 14, Jul. 28, Sept. 22

A luxury "safari" to the great national parks and game reserves of Uganda, Kenya and Tanzania. These offer a unique combination of magnificent wildlife and breathtaking natural scenery: great herds of elephant in QUEEN ELIZABETH PARK, in the shadow of the fabled "Mountains of the Moon"; a launch trip on the White Nile through hippo and crocodile to the base of the thundering MURCHISON FALLS; multitudes of lion and other plains game in the famous SERENGETI PLAINS and the MASAI-MARA RESERVE; the spectacular concentration of animal life in the NGORONGORO CRATER; tree-climbing lions around the shores of LAKE MANYARA; and the AMBOSELI RESERVE, where all types of big game can be photographed against the towering backdrop of snow-clad Mt. Kilimanjaro. Air travel is used where possible, enabling longer stays within the parks. Also seen are the fascinating capital cities of KAMPALA, NAIROBI and DAR ES SALAAM, the exotic "spice island" of ZANZIBAR, and the historic MOMBASA, a beach resort on the Indian Ocean, with its colorful Arab quarter and great 16th century Portuguese fort. Tour dates have been chosen for dry seasons, when game viewing is at its best. The altitude of most areas provides an unusually stimulating climate, with bright days and crisp evenings (frequently around a campfire). Accommodations range from luxury hotels in modern cities to surprisingly comfortable lodges in the national parks (some equipped even with swimming pools). Total cost from New York is \$1549.\*

\*Special rates from other cities on all tours. Tour cost includes Jet Air, Deluxe Hotels, Meals, Sightseeing, Transfers, Tips and Taxes.

For ALUMNI FLIGHTS ABROAD  
Full P.O. Box 99  
Details Lenox Hill Station  
Contact: New York, N.Y. 10021

Francis C. Card (right) and Eric M. Wormser (far right), of the Class of 1942, have both been named Executive Vice Presidents of their respective companies.



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**Carl M. Mueller** was awarded the Bronze Beaver, an award in recognition of distinguished service to M.I.T. The presentation was made at the September dinner of the National M.I.T. Alumni Officers' Conference held in Cambridge. The award was made in recognition of Carl's service as a member of the M.I.T. Corporation's Development Committee and Visiting Committees, of the Educational Council and of the Alumni Fund Board. Among others attending the conference were Mr. and Mrs. **Mitchell J. Marcus**, **Robert W. Blake** with his son who is presently a student at Duke University, Mr. and Mrs. **Franklyn W. Phillips**, Mr. and Mrs. **Donald MacDonald**, **Henry Avery**, **Erling Hustvedt** and **Walter Kreske**.

**Henry Avery** and his wife have been awarded Certificates of Appreciation for Patriotic Civilian Service during Hank's tenure as Civilian Aide to the Secretary of the Army for Western Pennsylvania.

Hank's certificate reads: "In recognition of his outstanding and meritorious service provided to the U.S. Army Air Defense Command in the Pittsburgh area. Mr. Henry Avery's unceasing personal effort, his dedication to the nation and to its military establishment, and his skillful use of his knowledge of military affairs have contributed in a highly significant way to the welfare of ARADCOM personnel of the Pittsburgh Defense and have greatly aided in the overall accomplishment of the mission of ARADCOM in the Pittsburgh area. Combining the knowledge and experience earlier gained as an Army Ordnance Officer with his current position as Civilian Aide to the Secretary of the Army for Western Pennsylvania, Mr. Avery has assisted generously and effectively in helping to maintain close and cordial relationships among Army Air Defense Personnel, local civic leaders, and members of other local Army activities. By a masterful application of his military knowledge from his position as a distinguished Pittsburgh business and civic leader, he has greatly aided the Pittsburgh Defense and its personnel in the area of civic-military affairs. Mr. Avery has consistently used his experience, knowledge, and ability to the great

benefit of the United States Army Air Defense Command and the Pittsburgh Air Defense." Prior to this civilian aide post, Hank had served several terms as President and Chairman of the Board of the Greater Pittsburgh Chamber of Commerce.

**Howard J. Samuels**, who parlayed his Kordite Corporation from a borrowed \$25,000 investment into a current \$100 million a year business and who subsequently became Undersecretary of Commerce, is now heading up the Small Business Administration. In this capacity his aim is to help small operators to expand and to help new businessmen get started. He is credited with two great strengths for this task—a strong philosophical commitment to the idea of helping minority members get a "share in the economy" and fresh experience at making a small business work. He believes that the government should spend more heavily than it does for such "human investments" as education and manpower training. He said: "Any corporation with the long-range interest of its stockholders in mind will pass up some of the dividends it could declare each year and invest for tomorrow. The nation must do the same."

**D. Reid Weedon, Jr.**, President of the Museum of Science and Hayden Planetarium in Boston, has announced a membership drive as part of the 20th anniversary activities of the Science Park and tenth anniversary of Charles Hayden Planetarium on the Charles River Basin.

**Kenneth G. McKay** was elected a member of the National Academy of Engineering. Election to the N.A.E. is based on an individual's outstanding contributions to engineering theory and practice or to the pioneering of new and developing fields of technology. The N.A.E. shares in the responsibility given the National Academy of Sciences by Congressional charter to advise the Federal Government at its request, on any matter of science and technology. Kenneth's election was based upon his developments in communications, especially in systems engineering and management of technical advances. He is Vice President-Engineering, American Telephone and Telegraph Company.

**Kenneth A. Bohr** reports that since the fall of 1966 he has been living in New Delhi, India as Deputy Resident Representative of the International Bank for Reconstruction and Development (World Bank). His oldest daughter has finished her sophomore year at Boston University after spending a first semester at Delhi University. His second daughter graduated from the International School in New Delhi and is currently attending Middlebury. His third daughter is currently a junior in Delhi University.

**Albert W. Kusch** has been appointed Vice President in charge of employee relations at Atlantic Richfield Company. He lives in Media, Pa.

**Robert M. Fano**, who organized Project MAC and has served as its Director in the five years that it has grown to become a major center for research in the computer sciences, has asked to be relieved in order to devote full time to teaching and research. He is Ford Professor of Engineering in the School of Engineering and Professor of Electrical Communications in the Department of Electrical Engineering, and is a recognized specialist in information theory, communications and data processing as well as large scale multiaccess computer systems. A native of Torino, Italy, Professor Fano joined the M.I.T. teaching staff in 1941, received his Sc.D. degree from M.I.T. in 1947 and during World War II, he worked on microwave components and filters at the Radiation Laboratory (co-author of Volume 9 of the Radiation Laboratory Series). He was Group Leader of the Radar Techniques Group at Lincoln Laboratory from 1950 to 1953 and has been a staff member of the Research Laboratory of Electronics since 1946. Appointed Ford Professor in 1962, Professor Fano co-authored two textbooks on electromagnetic theory and authored another book, *Transmission of Information*.

**Herbert R. Moody** is Special Gifts Area Chairman for the Houston-Beaumont area of Texas.—**Walter J. Kreske**, Secretary, 53 State Street, Boston, Mass.; **Everett R. Ackerson**, Assistant Secretary, 831 Cranford Avenue, Westfield, N.J.; **Michael Driscoll**, Assistant Secretary, 63 Center Street, Nantucket, Mass. 02554





Mr. and Mrs. Malcolm G. Kispert ('44) pose with their son, Robert G. Kispert, '68, following his commissioning in the U.S. Naval Reserve at M.I.T. on June 6. Brigadier General Leo A. Kiley, '39, Commander of the Air Force Office of Aerospace Research, delivered the address and awarded commissions at the M.I.T. exercises. (Photo: James F. Coyne from M.I.T.)

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**Richard Hughes** has moved from California, where he was head of Chemical Engineering at Shell Development Company, to the College of Engineering at the University of Wisconsin. . . . The Registrar's Office report shows **Harvey Kram's** daughter Kathy in this year's entering Freshman class. . . . The New York Times summary of yacht races in the metropolitan area continues to list **Jerry Coe** among the winners (last noted in the Riverside Yacht Club Regatta placing first in the Luders 16 Class). Apparently Jerry has not lost the skill acquired in M.I.T. dinghies on the Charles Basin. Although we mention sailing prowess first, Jerry must be doing something else right too. An article in the *Wall Street Journal* reports his election as a Vice President and General Manager of the Information Services Division of General Electric.

**Francis Card** was appointed Executive Vice President of Tenneco Colors Division of Tenneco Chemicals at Reading, Pa. . . . **Eric Wormser** is now Executive Vice President of Barnes Engineering Company. He continues to be involved in technical research, development and marketing of Barnes' infrared components and systems.

An A.E.C. announcement lists **Carl Laffoon**, a Vice President of San Diego Gas and Electric Company, as a participant in the Bolsa Island project meeting. The original plan calls for the construction of two nuclear power reactors and a large desalting plant on a manmade island.

**Bill Denhard**, Associate Director of the M.I.T. Instrumentation Laboratory was a member of the Program Committee for the recent Dartmouth College three-day Bearings Conference, sponsored by the Thayer School, Dartmouth and the American Ordnance Association.

The June issue of the *Proceedings of the U.S. Naval Institute* included an article on the Arab-Israeli War of 1967, by Captain **W. J. Kotsch**, U.S. Navy, who took the wartime meteorology course with our Class. . . . Also from the military,

**Art Sweeney**, Commanding Officer of Watervliet Arsenal has been nominated for promotion to Brigadier General.

Met **Bob Kraus** and **Adrian Marcuse** at the fall meeting of the Board of Governors of the M.I.T. New York Alumni Center. Bob is President of the Long Island M.I.T. Club this year and from their upcoming program, it will be a very successful year. . . . Let's hear from you. Not only looking for news but we'll run, as space allows, comment and opinion. What are you all thinking about politics, the generation gap, revolts on campus, fastpaced technological change or whatever?—**Ken Rosett**, Secretary, 191 Albemarle Road, White Plains, N.Y. 10605

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Since submitting the notes for the October/November issue of the *Review*, I have attended the Alumni Officers' Conference held September 6 and 7, in Cambridge. Twelve members of our class (four of them with spouses) were present. They were: **Burt Bromfield**, 72 Woodchester Road, Weston (our 25th Reunion Chairman); **Jay Martin** and wife Tink, 98 Love Lane, Weston (Jay is 25th Reunion Arrangements Chairman); **Stan Warshaw**, 19 Brentwood Avenue, Newton Center (our 25th Reunion Yearbook Chairman); **Mal Kispert**, 33 Sterling Drive, Dover, (our Class Treasurer); **Paul Heilman**, 30 Ellery Lane, Westport, Conn. (Assistant Class Secretary and President of the M.I.T. Club of Fairfield County, Conn.); **Pete Quattrochi**, Warwick, Rhode Island (our Class Representative on the Alumni Council, an Educational Councilor, Alumni Fund Special Gifts Chairman for Providence, and Vice President last year and President this year, I believe, of the M.I.T. Club of Rhode Island); **Martin King**, of Fairlawn, N.J., (Officer of the M.I.T. Club of Northern New Jersey); **John Nichols, Jr.**, and wife, of Lexington; **Norm Beecher** and wife, of Concord; **Jacqueline Findlay**, of Bedford (Assistant Director of the Alumni Fund); **Al Picardi** and wife Mary, 11403 Hounds Way, Rockville, Md. (a member of Bob Faurot's 25th Reunion Gift Committee and Vice President of the M.I.T. Club of Washington) and, of

course, the present writer. I do not recall seeing or talking with Mal Kispert or John Nichols; I talked with all the others.

Two weeks later, on September 20, the 25th Reunion Committee met at **Burt Bromfield's** home in Weston. Ten couples from our Class were present plus Fred Lehman, Alumni Association Secretary, and his wife, and James Hoey, '43. I was not present; however, six of 12 from the Conference were present for the Reunion Committee meeting. They were: **Burt Bromfield**, **Mal Kispert**, **Jay Martin**, **John Nichols**, **Pete Quattrochi**, and **Stan Warshaw**. The other four were: **Bob Breck**, of Weston (our Reunion Chairman); **Norm Sebell**, of Lexington (our Class Agent); **Louis Demarkles**, of Wellesley Hills; and **Pete Matthews**, of Needham. The Reunion Committee meeting was opened with Jim Hoey, '43, relating the experience of the Class of 1943 with their 25th Reunion. Jim discussed the methods used for fund raising, the expenses of the Reunion Book, and the favorable reaction to having had the reunion on campus. (For an account of the class of '43 reunion at Harvard last year, see *Atlantic* magazine for October 1968, "The Class of '43 is Puzzled," and the related cover story article, "The War Against the Young.")

The possibility of holding our reunion off-campus was discussed, but the majority voted to remain on-campus, particularly in view of Jim Hoey's remarks. Fred Lehman discussed ways in which the Institute would participate and contribute in arranging for the reunion. One argument advanced against having the reunion on campus was based on a comparison of accommodations. Fred responded that efforts would be made to use the new MacCormack Hall to a greater extent.

In considering programs, it was noted that 110 alumni, 100 wives, and 120 children had attended the Class of '43 reunion. (That class has an active roll of 516; ours has 758.) The age span ranged from 4 to 25 years of age. Naturally this required a varied program. **John Nichols** agreed to set up such a program for our Class with assistance from young people

who know what is required to appeal to those 25 and under.

Turning to the Reunion Book, it was agreed that advertising would be solicited to help defray the publishing cost.

**Pete Quattrochi** agreed to handle the advertising program. Incidentally, Pete received a recognition certificate at the Alumni Officers' Conference for his outstanding work on the Special Gifts Program last year in the Providence area.

**Mal Kispert** is preparing a reunion budget. We can expect an assessment of class dues from him, to finance the early costs in connection with the reunion. **Paul Heilman** is recruiting regional chairmen for the reunion from all over the country and perhaps the world.

**Bob Breck** continues as Publicity Chairman and was expected to have a timetable by October 15 for the various mailings required. (You probably will have received at least the first such mailing before these notes are published.)

**Stan Warshaw** continues as Chairman of the Reunion Book Committee. **Lou Demarkles** will assist him as well as Pete Quattrochi. **Jay Martin**, as Chairman of the Arrangements Committee, will maintain liaison with the Institute. **Pete Matthews** is in charge of purchasing such things as favors, prizes, and hats. **Norm Sebell** will work with Bob Faurot on the Class Gift. In that regard, **Al Picardi** is already planning to involve all classmates in the Washington area. (The weekend following the Conference, the Picardi's invited my wife, China, and I to be guests for a day of sailing on the Chesapeake Bay in their new Alberg 30 auxiliary sloop. It was a delightful outing. Al shared command with his son, Freddy.)

At the Alumni Officers' Conference I learned that for the year preceding the 25th reunion all members of the class receive the *Review*. That means classmates like **Ed Cochran** and his wife, Jane, in Hagerstown, Md., **Conrad Skladel** in Sunnyvale, Calif., **Richard L. Robinson** in Los Angeles, and many others will be seeing these notes in addition to known readers such as **Dick Kulda**, Orange, Calif., and **Bob Veitch**, Huntington, N.Y.

Another thing I learned at the AOC is the apparent reading pattern of classmates insofar as the class notes are concerned. A few of you who actually read the notes will recall that last year I made repeated reference to **Harold Knapp** of Germantown, Md., for his gigantic role as defender of justice in Montgomery County, Maryland, and to **James Mavor** and "The Lost Continent of Atlantis." A few, such as Jackie Findlay, recognized the stories. I found that most scan the notes for names they recognize without actually reading the column. This reaction was obtained from those classmates who are active in alumni affairs. Perhaps those who are less active have more time to read the notes. I also found from attending a workshop on the Alumni Fund (primarily for class agents) that only 9% of those who contribute state that receive-

ing the *Review* is a significant factor among their reasons for contributing. So it is not reasonable to assume that even most of those who contribute are especially interested in the *Review* or the class notes.

The obvious way to establish a more direct rapport with readers is to correspond with them individually. I still have not accepted the absolute necessity of doing so in order to handle this job the way it should be. Instead I'll again use this opportunity to extend Season's Greetings and urge all of you to include some classmates on your list for exchange of cards and then let me know what you learned. The same appeal last year produced no response whatsoever but I understand repeated appeals of this type can take hold after substantial repetition. I am sure there are ways to make this job richly rewarding.—

**Paul M. Robinson, Jr.**, Secretary, Information Systems Division, Navy, OP-914H, Pentagon 2B330, Washington, D.C. 20350, 202-697-6115, or 7710 Jansen Drive, Springfield, Va., 22150, 703-451-8580

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If the first section of these notes appear disorganized fear not; your Secretary is biding his time on a runway here at Westchester Airport in a low visibility downpour. We are only 90 minutes behind schedule and not yet air-borne.

**Charles "Chick" Street** in early September joined Pearson Boats, a Division of Grumman, at their new Portsmouth, R.I., plant. Chick will be Bill Shaw's first assistant in both design and production. For the past couple of years Chick has been dividing his time between his ship chandlery in East Greenwich and sail boat design at Dyers Anchorage in Warren, R.I. Chick continues to fare well in racing circles as he placed second in his old "wood hull" at Narragansett Bay's Fall 2000 Club Race. There were 30 to 35 Pearson boats in the race so Chick was a bit skeptical of the comments he would receive from his new employer following the race!

During the next 20 months you all will be regularly hearing about 1945's 25th reunion and 25th Reunion Class Gift. I have no intention of stealing any thunder from the money man, **Max Ruehrmund**, or the fun men, **Tom McNamara** and **Bill Shuman**. On the other hand, I would be remiss were I not to discuss the importance of both items. The bulk of us received a low-cost M.I.T. education thanks to Uncle Sam. If each of us were to return as a 25 Year Gift only the interest on this "free" education the Class could and would be proud of its efforts. Our 25th reunion will be an on-campus affair of which you all will be justly proud. The Boston/Cambridge environs of 1970 offer more than you can envision—including as they did 25 years ago beer



Robert F. Danner, '47

parties at Cranes Beach in Ipswich! Start saving your monies for both events today!

**Leavitt J. Pope's** son Joseph is a member of the Class of 1972 along with Bruce R. Hildebrand son of **Bob** and Virginia **Hildebrand** of Seattle. Both boys come from M.I.T. families with nine predecessors ranging from a great-grandfather in the Class of '81 to one uncle in the Class of '54—what a heritage!

**Jim McDonald**, a physicist at the University of Arizona (and an old meteorologist by trade) made banner headlines in an early September issue of the *Boston Globe* as he entered the UFO or Unidentified Flying Objects controversy during a recent Congressional hearing. Colonel **Don Campbell** recently returned from a tour of duty in Europe as Deputy Commander of the European Ground Electronics Engineering Installation Agency in Wiesbaden, Germany. Don is now at the Pentagon as Program Manager for the worldwide Automatic Secure Voice System.

**Don Lovell** formerly at the University of Michigan is now at the University of Massachusetts' astronomy research facility in Amherst. . . . **Allen W. Jayne** has re-affiliated with the Class. Welcome aboard Allen. . . . **Ed Ferrentino**, **Dave Flood**, **Bill Humphreys**, **Bob Maglathlin**, **Dave Trageser** and yours truly attended this year's Alumni Officers' Conference in early September.

Oh yes, Merry Christmas to you all!—**C. H. Springer**, Secretary, MFB Mutual Insurance Company, 420 Lexington Avenue, New York, N.Y. 10017

## 47

These notes are being written from French Lick, Ind., where Gina and I are taking a few days vacation tied into a convention. This should finish golfing





Walter E. Moore, '48

for the year and none to soon; this game keeps getting more difficult rather than easier.

Bill Maley, '48, dropped by the house for dinner the other night and it was most enjoyable to rehash old times and acquaintances. Met Charlie McDonnell, '48, at lunch at our plant in Phillipsburg, N.J. This fellow ex-Bostonian is now with U.S. Testing Labs. Have not encountered any fellow '47 men recently but '48 is pretty close. . . . **Ben Brewster's** son Ben, Jr., is the fourth generation to enroll at M.I.T. He is in this year's entering class. . . . **Norm Rupp** represented the Institute at the Centennial Celebration of Oregon State. From his measurements for academic regalia Norm must be staying in good physical shape.

**Paul Cook, Bob Michaud** and **Don Cottle** received Certificates of Appreciation from the Alumni Fund for their roles in making the 1968 Fund a great success.

I noted in a couple of publications that **Huey Long** is doing quite well in sailing races with his boat Ondine, the largest of the current sailing fleet. This means that he normally crosses the finish line first but victory depends upon time handicaps. As I recall he won this year's transatlantic race. Is that right Huey? . . . **Don Aikin** is now

Manager of Corporate Economics for Goodrich Gulf Chemicals whom he joined in 1959 after a stint with Houdry Process Corp. . . . **Harl Aldrich** advises that he is now President of the Boston Society of Civil Engineers. . . . **Bob McNitt**, now a Rear Admiral, writes that he has been assigned as Superintendent, U.S. Naval Post Graduate School. Prior to this he was Commander of the cruiser destroyer flotilla in Norfolk. . . . **Arnold Judson**, though back from England for several years, is still working some with the U.K. and Ireland as senior management consultant in the Organizational Behavior

Group of A.D. Little. . . . **Adelaide Toomb Sundin** writes that she and her family are now back in this country after residing for 10 years in Sweden. The boys are now 13 and 11 and she is occupying her time modeling bas relief portraits of children in porcelain. This spring she had a one woman show at the Veerhoff gallery in Washington, D.C.

A few new addresses: **Gene Gettel** with G. E. Computer Division in Phoenix, Ariz.; **Ed Cote** in Timonium, Md.; **Martin Hellar** in Novelty, Ohio; **Jack Lehmann** in Wilmette, Ill.; **Richard Potter** in Mansfield, Ohio; **Marvin Sweeney** in Houston, Texas; and **John Putnam** with Creole in Tia Juana, Venezuela. **Phil Jonsson** has moved his base of operations from Midland to Dallas. **Frank Worsam** has gone from Kansas to Washington, D.C. with what appears to be his own consulting firm. **Brooke Pietsch** has moved from Switzerland to Surrey England. Still with Esso, Brooke, or has that long since changed?

Seeing these S.A.E. names makes me wonder if it is not time to have another fraternity reunion. This is sure an easy way to ask. What about it fellows—is there interest in any specific time and place? Let's hear from you.

**Jordan Baruch**, Vice President of Research at Bolt, Beranek and Newman of Boston has been elected President of the Inter-university Communication Council (Educum) headquartered in Cambridge. Dr. Baruch is recognized as one of the pioneers in computer time sharing systems. . . . **Paul Schilling**, President and a Director of Plastics Inc., of St. Paul, was elected a Director of Anchor Hocking Glass. . . . **Robert Danner** has been named manager of manufacturing and procurement for Raytheon's Space and Information Systems Division in Sudbury. Bob, his wife and two teen-age children reside in Wellesley Hills. . . . **Johnny Taft** has been appointed Vice President for Honeywell's Computer Control Division in Framingham. Another note from Framingham: **Emery Ploen** is now Senior Controls Engineer of Avco's Bay State Abrasives division.

**Bob Keepin** was elevated to Fellow of the American Nuclear Society at the spring meeting in Toronto. . . . **Eldon Jetton** was a guest speaker at a series of graduate seminars at the University of Texas. . . . **Paul Kiefer** was given the annual award for outstanding contribution to America's space program by the American Institute of Aeronautics and Astronautics. He was selected for his significant contribution to the Gemini rendezvous system and the development of a lunar television camera for the Apollo series. Paul is with Westinghouse.

**Paul Bock** received quite a bit of publicity in Hartford triggered by his letter to the Hartford Times stating that there was ample water available to allow ghetto children to use sprinklers during the sweltering heat. Paul should know

of what he speaks since he is the director of hydrology and water resources of the Travelers Research Center.

Now that this job is done my conscience is clear and maybe those ten-foot puts will drop! Let's hear from you.—**Dick O'Donnell**, Secretary, 28516 Lincoln Road, Bay Village, Ohio 44140

## 48

It seems particularly appropriate to write this month's column here on campus in Baker House, Room 505. The 1968 National Alumni Officers' Conference begins tomorrow morning. I am anxious to hear the students who will speak as part of a panel moderated by Ken Wadleigh, '43, who was a popular thermodynamics lecturer in our undergraduate days. Ken is currently Dean of Student Affairs, and he is to be commended for his important share in providing the atmosphere that promotes the high degree of responsible behavior of the students.

The Alumni Officers' Conference provides training materials for club, class, fund officers, and educational councilors to help implement the objectives of our Alumni Association. Representing our Class were: **Bill Bangser, Jr.**, Westport, Conn.; **Joe Bongiovanni**, DeWitt, N.Y.; **Ken Brock**, Bill and Pat Grant, Glen Rock, N.J.; **Bill and Therese Hart**, Glens Falls, N.Y.; **Neil Helmers**, Madison, Tenn.; **George Oberbeck**, Belmont, Mass.; **Jack Page**, all the way from Dallas; **Ed Hanley**, even further from Denver; **Peter Richardson**, Cambridge; **Hans and Sue Wydler**, New York; **John Walsh**, Nutley, N.J.; and **Mansfield Young**, Boston. Also attending were our President, **Sonny Monosson**, Vice President, **John Reid**, Twenty-five-Year Gift Chairman, **George Wayne** and yours truly.

As you probably know only two well, **Ken Brock** of our Class is the Director of the Alumni Fund. He is so proud of his planned training sessions that he has invited a member of the Princeton Alumni Office to be a student. Of more interest to us is another student in Ken's arm twisting clinics—**George Wayne**, our 25th Reunion Gift Chairman. I'm sure Ken will be suggesting some great new goals to George and providing ideas on how to accomplish the results.

**Bott Mott**, who recently retired as Secretary of our Class, wrote describing the responsibilities of the job. He was in Newport, R.I., for a week teaching teachers at the annual T.M.N.E. Summer Institute. Although Newport is only a short drive from Barrington, we missed getting together to review the good old days with Walker Memorial Dining Service. If you ever worked for the Walker Dining Service, I'd appreciate a note so that at future class activities, we can have a reunion and celebrate our increases from the \$0.35 per hour that we were paid. Bob is the new Director of Studies at Kent School in Conn.

Last month the class notes described some of the events during our 20th Reunion on Martha's Vineyard in June. Although an after dinner speaker had not been planned, at the last minute a minister from a nearby church was invited to comment on the murder of Robert Kennedy which had just taken place a few days earlier. After the eulogy, **Bill Katz**, the Master of Ceremonies, awarded the trophies to the winners of the various athletic events. In addition to the athletic competition, awards were made to **Roger Sisson** for the most hair—a luxuriant beard. Roger has recently published a book and is on the faculty at the University of Pennsylvania. **Mel Berkowitz** had the least hair. **John** and **Janey Kirkpatrick** and **Denny McNear** had come from California and with the aid of a stretchable ruler it was decided to award Denny the prize for the greatest distance traveled. **Bill Grant** and **Dick White**, who were roommates as undergraduates, shared another distinction. They each have a family of seven children and tied in the contest for the largest family. Their reward—one-half a birth control pill apiece. Another award for a fine accomplishment—the couple married longest—was awarded to **Ralph** and **Annette Vacca**. Unquestionably eligible, but perhaps the winner because he was most honest, was **Bob Crane** who was the heaviest person present and admitting his weight. Bob is working for his Ph.D. in medical instrumentation and supporting Libby and the kids from his manufacturer's representative business.

**Verity Smith** won the prize for most recently married with an elapsed time of minus one week. Verity, married a week after our reunion, is launching his own firm, VapOnics, to manufacture distillation equipment. . . . After dinner the band played until midnight when the "blue laws" stopped the music and the drinks. **Bill Katz** played old time favorites on the piano and everyone joined in the singing. Outside of the hotel in the fog bank that blanketed the island, I met **Al Carr**, still a bachelor, enjoying a stroll. It was 2:00 a.m. when I retired for the night on Martha's Vineyard at our 20th reunion.

On Sunday the pool, the bicycles, and the dining room continued to be popular, but gradually everyone began the journey home. The fog at midday made the ferry ride a risky venture, but the radar didn't fail and everyone returned safely. On the 5:00 p.m. ferry, **Harry** and **Eleanor Ottobriani**, **Haig** and **Jenny Yardumian**, **Ed** and **Billie Carlson**, and I enjoyed the brisk clear air that allowed us to enjoy the view as we rode home from our 20th reunion.

**James A. Crites** has been named a Regional Vice President of the Chilton Company, representing Chilton management with advertisers, advertising agencies and marketing services in the west. James works out of Chilton's Los Angeles office and lives with his wife and daughter at 16371 Ardsley Circle, Huntington Beach, California.

The Assistant Secretaries of our Class are **David Vigoda** and **Bob Day**. **Bob Schneider** has also helped by preparing a portion of the column based on clippings of our classmates' achievements. . . . **Sonny Monosson**, our Class President, recently formed a new company, The Boston Computer Group, Inc. His company is conducting a study of maintenance of Automatic Data Processing Equipment of any nature, all the way from simple keypunchers up to large computers such as a 360/85 or a Univac 1108. The study is sponsored by the General Services Administration. If you are working for a company that has an in-house maintenance organization or a peculiar maintenance arrangement with a vendor, Sonny would appreciate receiving a note so that he could arrange to visit you. This is a sure way to have an old classmate visit! Wanted or unwanted!

**William Brauer** (St. Louis) has been elected to the Board of Control of St. Paul's College, Concordia, Mo. . . . **Harold Dutton** reports that his past four years have been spent at the Centro de Investigacion del Politecnico (Mexico) working on statistical properties of neural responses, hmmm! . . . **William Ayer**'s current hobby is building a new home. One hobby has led to another—Bill has six children. . . . **Dean Ammer**, director of Northeastern University's Bureau of Business and Economic Research, authored several articles in recent issues of *Purchasing Magazine* on which he serves as Economics Editor.

**Robert Erlandson** is now with Fabric Research Laboratories, Inc., as a Senior Research Associate. . . . **Sanford Siegel**, professor of botany and plant physiology at the University of Hawaii, was guest speaker at the past awards dinner, Rockhurst College, Kansas. The title of his presentation was "The General and Comparative Physiology of Life Under Stress." Were you in Chicago, Doc?

**Philip Marsilius** received an honorary Doctor of Engineering degree from Norwich University for his contributions to Norwich and to industry. . . . **William Welsz**, Skokie, Ill., Vice President and General Manager, Motorola Communications Division, has been elected to the Board of Directors of his company.

**Donald Graham** now heads up the planning department of the Massachusetts Bay Transportation Authority. How about a new underground station beneath Building 10? . . . **Herb Marcus** is beset with the problem of where to display all the awards he has won while racing his 27 foot sloop, *Silkie*, up and down the New England Coast.

**William Harris, Jr.**, co-chaired the 1968 Engineering Foundation Research Conference. . . . **Gilbert Rohleder** reported on the technological advances of transmission pipelines in a recent issue of *Pipe Line Industry*, and **Gordon Pettengill** co-authored, with fellow researchers at

M.I.T.'s Lincoln Laboratory, a report on the moon's gravitational forces that appeared in the May issue of *Science*, while **Ralph Shapiro**, researching at the Air Force Cambridge Research Laboratories, reported on the earth's magnetic disturbance field.

"**Walt**" **Moore** has been promoted to manager of technical services in the development department of Firestone Tire and Rubber Company. . . . **Robert Langer** was named a Vice President of Canadian Badger Company, Limited, responsible for co-ordinating business activities as they relate to the consulting, engineering and construction services offered by the company. "Bob" resides at 87 Beacon Street in Boston.

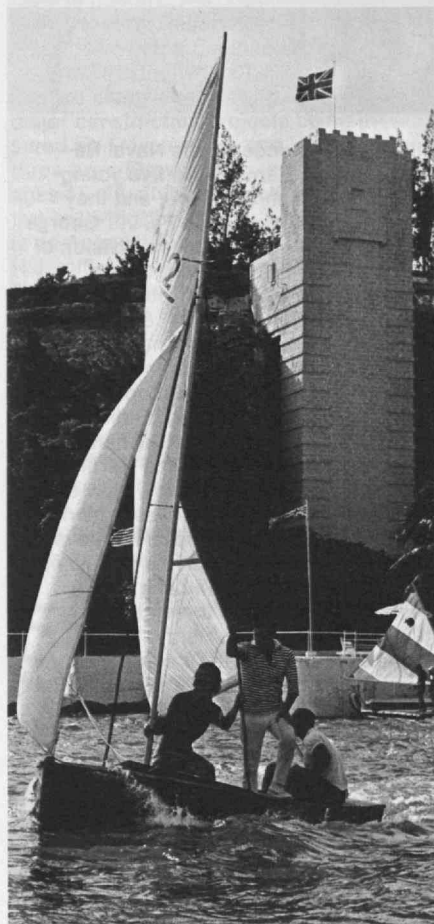
**Scott Dwight Thayer**, formerly Senior Research Scientist at The Travelers Research Center, has been appointed Vice President of Geomet Inc., of Rockville, Md. . . . **Bascom W. Birmingham** has been appointed Executive Officer of the N.B.S. Boulder Laboratories and will also continue as Chief of the cryogenics division. . . . **Philip Bragar** has been promoted to Associate Personnel Director of the Mitre Corporation. He will concentrate on the administrative and personnel related aspects of the establishment and subsequent support of domestic and foreign sites. "Phil" has been with Mitre since 1959 and continues to reside in Newton Center.

Recent promotions at the Institute include: **Leonard A. Gould** to Professor of Electrical Engineering and Elmer Larabee to Associate Professor Aeronautics and Astronautics. . . . Professor **Robert I. Hulsizer** has been appointed Director of the Institute's new Education Research Center. The Center is concerned with research on the fundamental problems of education and learning and will consider new college-level curriculum including teaching materials in the humanities, social sciences, architecture and management, as well as science and engineering.

**R. C. Dean, Jr.**, has been elected a Director of the Ecological Science Corporation of Miami. "Bob" is also president of Creare Inc., of Hanover, N.H., which has interests in construction and owns and operates water-treatment and waste-disposal utilities. . . . **Howard N. Smith**, President of Anderson Power Products, Inc., is moving his plant's offices and manufacturing facilities from A Street in Boston to the Brighton area adjacent to the Massachusetts Turnpike near Newton.—**Martin Billett**, Secretary, 16 Greenwood Avenue, Barrington, R.I. 02806; **David Vigoda**, Norfold Electric Company, 1262 Boylston Street, Boston, Mass.; **Bob Day**, Foxboro Company, 2270 Noblestown Road, Pittsburgh, Pa.; **Robert Schneider**, Garden City, N.Y.



Join us on board. Come to the Castle Harbour Hotel in Bermuda (below) where boating will be only one of the many fun activities to enjoy during our 20th reunion. Remember these dates: June 9, to June 15, 1969.



## 49

Plans for our precedent-setting reunion in Bermuda are now being finalized. Brochures have been mailed out to all who responded to our questionnaire. You can have your packet of information simply by putting your name and address on a postcard and sending it to me. As you look over the packet, you will realize that an unusual amount of work has gone into the planning. You might like to know that roughly 250 classmates and wives are expected to come; that the majority plan to stay from five to seven days; 100 children are coming; the Class of 1946 is joining us for the fun; the formal part of the reunion will be most informal. So plan your vacation for the

June 9 to June 15 period. Many others are. We are particularly indebted to Pan American Airways and The Castle Harbour Hotel for professional guidance on many reunion details.

As you may know, nothing warms the heart of a Class Secretary like a personal letter. My thanks go to the following four men who took the trouble to drop a line.

**Daniel W. Greenbaum** is an engineer with and a Director of Madigan-Hyland, Inc., Consulting Engineers, in Long Island City, N.Y. He has been principal in the following projects: Feasibility surveys for design and financing of the New York State Thruway; Verrazano-Narrows Bridge, Colombian National Railroads (South America); Long Island Sound crossing—now under study; Lower Manhattan Expressway, etc. Dan and his wife Pat have two daughters, Anne (14) and Sue (12). In his spare time, of which he has precious little, he likes to sail. He is active in local town government of Mamaroneck, N.Y., and says that he misses his many M.I.T. friends. Drop me a card, Dan, and I'll let you in on a little scheme for meeting all your old buddies under most pleasant circumstances. While you're at it, drop me the names of your old buddies and I'll see that they learn about the scheme also.

Capt. **Helmer S. Pearson**, who earned his M.S. in EE with us, writes that he has been ordered to the Coast Guard Headquarters in Washington, D.C., as Deputy Chief of Engineering for the Coast Guard. His address is 718 Midland Road, Silver Spring, Md. 20904.

**Ernest R. Barriere** is manager of a nuclear power plant used for training Navy personnel and for research and development. The plant is identified as the Kesselring Site of the Knolls Atomic Power Laboratory of General Electric in Schenectady, N. Y. Ernest has three children in college and three more to go.

Captain **Edward Muhlenfeld** recently returned from a year and a half of sea duty and is based in Norfolk, Va., as Commander of Service Squadron Four which consists of 22 assorted major underway replenishment ships. Captain Muhlenfeld is a member of OSD's

Weapons Systems Evaluation Group in the Washington, D.C. area.

**George H. Kunstadt** is President of Alpha Data, Incorporated, of Tarzana, Calif. The new company (announced July 23, 1968) will be active in the development and production of data handling and storage devices. One of the company's products is a magnetic disc memory having a potential data transfer rate of up to thirty million bits per second. . . . **Arhie Harris**, who has been our Class Agent for these many years, is retiring from office. To him go our thanks for a job well done. His duties will be taken over by **Milt Bevington** from whom you should have heard by now. . . . **Bernard D. Steinberg**, Vice President, General Atronics Corporation, Philadelphia, Pa., lectured at the Faculty Seminar of the Electrical Engineering Department at the Technion Israel Institute of Technology in Haifa, Israel, while on a recent visit there. He spoke on "Sidelobe Statistics of Large, Random Arrays." Bernard is a Fellow of the I.E.E.E. He, his wife Jacqueline, and their four children reside at 7908 Pine Road, Wyndmoor, Pa., where both parents are active in civic, educational, and recreational activities. . . . **Jack Barriger** (John W.) has left his post with the Santa Fe Railroad after 18 years and has joined Sylvania here on the East Coast as Manager of Transportation Control Systems for the Commercial Electronics Division in Bedford, Mass.

Phosphorous, the nutrient of lake-choking plant life, was named among the most urgent problems in the field of municipal waste treatment by Professor **John B. Nesbitt** of Penn State University at the 40th Annual Conference on Water Pollution Control last August. Addressing the Tertiary Waste Water Treatment session, Professor Nesbitt said Primary, secondary and tertiary treatment all use chemical precipitation for phosphorous and phosphate removal, and ion exchange is employed at the tertiary stage.

**Jack H. Westbrook, III**, Sc.D.'49, a program planner at General Electric's Research and Development Center in Schenectady, N.Y., has been appointed chairman of the Materials Research Program Committee of the American



Lieutenant Colonel James G. Howcroft, '54 (right), has received the Merewether Award, presented annually to the individual in the Air Weather Service who makes the most significant technical contribution to military meteorology. Major Arthur Sargent, Jr., '54 (far right), is shown receiving the Distinguished Flying Cross at Eglin AFB. Major Sargent flew through intense ground fire and hazardous weather to resupply allied ground troops in the Khe Sanh area.



Society for Metals. Dr. Westbrook's committee is concerned with advances in the science and technology of metals and materials which are to be publicized through papers and reviews before the Materials Engineering Congress. He has specialized in the study of the mechanical properties of intermetallic compounds, grain boundary effects, and composites. He is the author of more than 50 technical papers, has edited three books and also holds three patents.

Dr. **Robert L. Hamman** has been appointed Professor of Economics and head of the Economics Department at Drexel Institute of Technology in Philadelphia, Pa. Bob was formerly Chairman of the Division of Economics and Management at Pennsylvania Military College, Chester, Pa., where he has twice been cited by the student body as Most Distinguished Professor of the Year. Bob is married, has two daughters, and resides at 4916 Old Hill Road, Sedgely Farms, Wilmington, Del. He is Vice President of the Sedgely Farms Association.

**Rex Gilbert Fluharty**, VIII, Ph.D., '49 has recently joined the Los Alamos Scientific Laboratory staff in New Mexico to work in the Experimental Physics Division. He received a B.S. in physics from the University of Idaho. A member of the American Nuclear Society and the American Association for the Advancement of Science, he leaves a post as Manager of the Nuclear Technical Branch of the Idaho Nuclear Corporation in Idaho Falls and is joined in Los Alamos by his wife, Muriel, and two children.

**Charles O. Miller** has been named Director of the Bureau of Aviation Safety in Washington, D.C. This one hundred seventy-five-man bureau, largest under the National Transportation Safety Board, is charged with investigating and advising the board on the causes of all U.S. civil aircraft accidents. A former test pilot with Chance Vought Aircraft, Chuck, for the last five years, has been a member of the staff of the Institute of

Aerospace Safety and Management at the University of Southern California. A prolific writer in his field, his publications on system safety, human factors, law/safety relationships, and safety information communications are numerous. He is married and has five children.

We have learned, through a letter from his estate, of the untimely death of **Harold L. Humes, Jr.**, on January 26, 1968. Harold's last address was 250 W. 94th Street, New York City. The class extends its deepest sympathies to the family including Harold's father who is a member of the Class of 1922.—**Fletcher Eaton**, Secretary, 42 Perry Drive, Needham, Mass. 02192

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**William Carmack** has joined Monsanto in St. Louis, Mo. His hobby is now boating on the Mississippi and Missouri Rivers (riverboating?). . . . **Charles** and **Helen Elliott** live in Lexington, Mass., and have a twelve-year-old son. Charles is a Market Applications Engineer at the Sylvania Lighting Center in Danvers, Mass. (this is the group responsible for promoting all night golf courses). His activities include Illuminating Engineering Society and I.E.E.E. He was the session organizer for the October annual technical meeting of I.E.E.E. on computer aided lighting design. . . . **Jack Carpenter** is Vice President of American Science and Engineering in Cambridge, Mass. The firm is active in the field of monitoring X-radiation equipment development and recently received comment in *Time* magazine with regard to their X-ray telescope which is being used to plot the sun's structure and that of solar flares. Jack and his family live in Weston, Mass.

**Robert Lord** is with Atlantic Richfield and was recently assigned to the New York (Park Avenue) office. Bob, Else-Marie and their two children live in Larchmont. . . . **William Hazlett, Jr.**, is with the Naval Air Development Center, Johnsville, Pa.

**Bill** is a Commander in the Naval Reserve. He and Harriet have five youngsters, ages ten through two, and they live in Upper Black Eddy, Pa. . . . **George Hogue** is with the Aerospace Division of the Advanced Development Group, Westinghouse Electric Corporation. The Hagues (Eleanor, Larry, 24, and Sue, 15) live in Annapolis right on Chesapeake Bay. Pastimes: sailing, water-skiing and fishing, of course. George reported that **Frank** and **Alice Greene** and their family (four sons) stopped by to visit him. **Franklin Horlebein** is with the Hardinge Company (Koppers Company, Inc.) as Plant Superintendent. He lives in York, Pa., and he and Martha have two boys (Steve, 12 and John, 8) and a girl (Ann, 10). . . . **John** and **Gloria Lang** live in Vienna, Va., and have three children (Jana Leigh, 14; John Henry, 13; and Maree Dee, 8). John is Director, Production Operations, with the Yeonon Organization. . . . **James Logan** is President of Logan-McPeak, Inc., General Contractors. He lives in Pulaski, Va., and he and Nancy have two sons (John, 9 and George, 6). . . . The Reverend **Charles R. MacDonald** is now living in Wilmington, Del. He and wife, Jeanne, have two children, a boy seven and one of the other kind, age four. . . . **Thomas F. McLaughlin** is with DuPont plastics department in Wilmington, Del. Tom's activities with DuPont have included development work with Olefin copolymers and ionomers.

Another of our classmates in the construction business is **Marc J. Pearlman**, Treasurer and General Manager of Sterling Engineering and Construction Company, Inc., in Providence, R.I. Marc and Eleanor have four children all the way from 16 to 6. . . . **Clint Seeley**, one of our several M.D. types, is still in Andover, Mass., where he is "still building castles in woods for Gail and the four dwarfs (all growing rapidly)." Clint was recently elected Chief of Radiology at Melrose-Wakefield Hospital and was elected to the Executive Committee of the Massachusetts Radiological Society. He has taken up collecting pre-1940 used cars—under six inches long—and asks if any of



our classmates have such in their attic. (If you have, he would like to hear from you). . . . **Thomas W. Smith** is the Assistant Chief Engineer of the McNeil Corporation in Akron, Ohio. Tom and Billie have two children.

**Sandy Sussman** remarried last year; his new wife is Judith Gordon Axinn and they are living in Woodbury, N.Y. Sandy, with S & J Sales Associates in Jamaica, N.Y., has been active in Little League (President, 1968) and is a Director of Schoolhouse Industries, Inc. . . . **Michael Tinkman** is Gordon McKay Professor of Applied Physics at Harvard. He and Mary live in Belmont, Mass., and have one son who is almost three. . . . **Kenneth Weber** is with the Travelers Insurance Company in Newark, N.J., office of the Casualty Property Department. He is a representative in the Engineering and Loss Control Division where his responsibilities are safety engineering services for major construction projects being insured by Travelers. He and Virginia have three boys (Steve, Doug, and Andy, ages 15, 12, and 5 respectively); they live in Livingston, N.J. . . . **James Weisel** is an Account Executive in the Paramus, N.J., office of Merrill Lynch, Pierce, Fenner and Smith. The Weisels also have three children (Gary, 12; Tom, 9; and Karen, 6) and live in Oradell, N.J.

Holiday Greetings!—**Howard L. Levings-ton**, Secretary, 358 Emerson Road, Lexington, Mass. 02173; Assistant Secretaries: **Walter O. Davis**, 346 Forest Avenue, Brockton, Mass. 02401; **Paul G. Smith**, 11 Old Farm Road, North Caldwell, N.J. 07006; **Marshall Alper**, 1130 Coronet Avenue, Pasadena, Calif. 91107

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**Frank A. Aschenbrenner** is directing the activities of the American Institute of Aeronautics and Astronautics in Orange County, Calif. Dr. Aschenbrenner is Assistant Director of North American Rockwell's Space Division in Downey.

**Edwin G. Eigel, Jr.**, was named Dean of the Graduate School at St. Louis University last May. He is an Associate Professor of Mathematics. Promoted to full professor at Virginia Tech. College of Engineering is **Themistocles P. Floridis**, a member of the metals and ceramic engineering department.

Army Major **Joseph P. Goncz** was named to the commandant's list of the top graduates at the U.S. Army Command and General Staff College, Ft. Leavenworth, Kansas. Major Goncz is assigned with the U.S. Army Element, Test Command, Defense Atomic Support Agency at Sandia Base, New Mexico. . . . Lieutenant Colonel **James G. Howcroft** has been honored with the Merewether Award for his contribution to computerized weather forecasting. Colonel Howcroft developed the weather prediction program which is now in use at the Air Force Global Weather Central at Offutt A.F.B. in Nebraska.

**Helmut J. Maier** is attending the 16th session of the Program for Management Development (PMD) at Harvard's Graduate School of Business Administration.

**George J. Power, Jr.**, has been appointed product manager for copol latexes by W. R. Grace & Company's Dewey and Almy Chemical Division, Cambridge, Mass. . . . Major **Arthur Sargent, Jr.**, has received his second air medal for air action in Southeast Asia and is now a Research and Development Director for the Tactical Air Command at Eglin A.F.B. in Florida. . . . **Jack H. Vernon** has been elected Vice President of Manufacturing of Instron Corporation, Canton, Mass.

Reunion plans are moving forward under the chairmanship of **Bob Warshawer**. The Jug End in the Berkshires which offers a wide range of activities (golf, tennis, swimming, skeet shooting, horseback riding, and tours to local antique shops and a pottery manufacturer) has been selected. We would appreciate any ideas which you might have for your reunion. Communicate! Best Wishes for the holidays to you and your family.—**E. David Howes, Jr.**, Secretary, Box 66, Carlisle, Mass. 01741

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Let us take this opportunity to wish you a joyous holiday season and a good new year—and to remind you that we especially value a heavy mail at this time.

In June **Rodney Logan** received an M.S. in Mathematics at the 100th commencement of Worcester Polytechnic Institute. Shortly thereafter **William Lehmann** opened his medical practice (otolaryngology—ears and larynx if it will save you a trip to the dictionary) in Hartford. Having received his M.D. from Yale, Bill spent five years of internship and residency at Duke Medical Center and two years in the Air Force. With Gail, a graduate of Hartford Hospital School of Nursing, and their two children, he now lives in Wethersfield, Conn. **Robert Dettmer**, formerly Vice President and Operations Director of Tasa Corporation, joined the "Automatic" Sprinkler Corporation of America, in Cleveland this past summer as President of its Scott Aviation division.

In July **Irwin Gruverman**, S.M., was appointed Technical Director of Sources and Nuclides Division, one of three new operating divisions of the New England Nuclear Corporation in Boston. He lives in Needham with his wife and two children. Sequential Information Systems, Inc., of Elmsford, N.Y., announced in July that it would soon offer its stock to the public for the first time. The company, which was formed in 1961 and began marketing in 1963, is currently engaged in the manufacture and marketing of optical encoders, position velocity control systems, and computer software which it recently entered through a wholly owned subsidiary in Washington,

D.C. **Irwin Sterman** is Vice President and Engineering Director; **Murray Vinarub** is also a Vice President. . . . Last spring **Richard and Ella (Paton) Gardner**, Andres, three, and Paul, one, moved to McLean, Va. Dick is now in the Economic Development Agency of the Department of Commerce in Washington, involved in planning to improve areas in the country which are below certain economic standards (by the development of utilities to attract needed industry, for example). From another branch of the Department of Commerce, the National Bureau of Standards, comes a paper on the coming (January 1, 1969) change in the reference base of the U. S. legal volt. Among the references cited for details on the change are a couple of articles by **Robert Culkosky**.

Slated to present a paper at the September Dartmouth College Bearings Conference was **Herbert Singer** of the M.I.T. Instrumentation Lab. One of the speakers at The Institute for Administrators of Pupil Personnel Services at Harvard in July was **Warren Bennis**, Ph.D., Provost of the Faculty of Social Sciences and Administration of the State University of New York at Buffalo. The apparent lack of creative innovation with education was the subject of exploration at the Institute this summer. Finally Lieutenant Colonel **Richard Connell** was among 205 officers completing a 42-week course at the U.S. Army War College, Carlisle Barracks, Penn. A recipient of the Legion of Merit, Joint Service Commendation Medal and the Army Commendation Medal, he and Betsy live in Falls Church, Va.—Secretaries: **Dell Lanier Venarde** (Mrs. J. H.), 16 South Trail, Wilmington, Del. 19803; **L. Dennis Shapiro**, 130 Lincoln Street, Boston, Mass. 02135

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The fall Alumni Officers' Conference was attended by a dozen classmates and wives including: **Walt Frey**, **Walter Bachman**, **Ed Baker**, **George Brattin**, **John Stelling**, **Paul Cianci**, **Warren Briggs** and class officers. Featured at the conference was a lively dialogue with student leaders on their increasing involvement with the operation of the school, politics and poverty programs.

**Frank Bader** is Acting Chief Engineer of Dorne & Margolin, Inc., of Bohemia, N.Y. Frank, his wife and three children live in Stony Brook. . . . **Roger Borovoy** is now corporation Patent Counsel for Fairchild Camera. . . . **Ray Bowen** is one of 13 N.A.T.O. senior foreign fellows this year. Ray is doing his work at Imperial College in Leeds, England. . . . Did you know that **Judith Gorenstein Ronat** has a cousin in the class of 1972? . . . **Bill Grinker's** company, The Boston Computer Group, is now studying the maintenance of data processing equipment and is interested in starting a dialogue with classmates in the field. . . . **Charles Kruger**, Associate Professor of Mechanical Engineering at Stanford, returned to Tech in October to conduct a seminar

on Magnetohydrodynamic Power Generation. Chuck is N.S.F. senior post-doctoral fellow at Harvard this year.

**Louis Maisel** wrote "Noise Cancellation Using Ratio Detection" for the July issue of the *I.E.E.E. Transactions*. Louis has worked for Sperry Gyroscope, Dynell Electronics Corporation, the Aerospace Corporation, and is now at the Sperry Rand research center in Sudbury, Mass.

**Phil Platzman** has another promotion at Bell Labs, where he is head of the Solid State and Plasma Physics Research Department. . . . **Mike Schiller** is President of Sequential Information Systems of Elmsford, N.Y. Sequential, which recently went public, manufactures optical encoders and other computer hardware and software.

**Dick Skavdahl** is Project Engineer on General Electric's Fast Ceramic Reactor Development Program in California. In August, he spoke at a conference on fast reactors at Rensselaer Polytech.

**John Wenning** has been appointed Chief Engineer in the Division of Industrial Safety and Building of the State of Wisconsin. John has previously held several posts in various other state agencies. . . . The **Bredehoffs** announce the birth on September 25 of their second son, Scott Denton.—Co-secretaries: **Bruce B. Bredehoff**, 16 Millbrook Road, Westwood, Mass. 02090, **T. Guy Spencer, Jr.**, M.I.T., Room E19-439, Cambridge, Mass. 02139

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I am in the fortunate position of having a massive fund of news to report. In a brief note, **Gerald Murphy** advises that he is working as District Manager for the U.S. Chamber of Commerce in Indiana and Kentucky. This involves development of political and economic education, legislative action, and community development programs in local and state Chambers of Commerce. Gerald is married to the former Joan Lauterbach from Chicago and has two sons. . . . **Ernest Peixotto** is leaving his present assignment as Special Assistant for Plans and Policy to the Chief of Engineers, U.S. Army and is going to Vietnam as Commander of the 20th Engineer Combat Battalion.

**James McNeely** reports that he has been with Monsanto Company's Semi-conductor Materials Department and has just received an M.A. in chemistry from Washington University in St. Louis.

**Alan Borstein** moved to Los Angeles in January of 1967 and in October of the same year, married Brenda Astrow. He is now working for the R. A. Watt Company, a subsidiary of Boise Cascade Corporation, which is involved nationwide in home building. He serves as Executive Vice President for Administration and is in charge of all expansion areas.



'57 classmates get together abroad

**Karl Duff** dropped us the following note: "I just finished two years as the Navy's new Construction Project Officer on the Lockheed Hydrofoil Plainview (AG EH-1) and Boeing Hydrofoil Tucumeari (PGH-2) which were delivered to the Navy in March, 1968. I am now Officer-in-Charge of the Hydrofoils Trail Unit in Bremerton, Wash., involved in trials of R & D hydrofoils."

In April **Joel Schiffman** completed two years of army service. In January of this year he was certified by the American Board of Orthopaedic surgery and entered private practice in Alexandria, Va., in June. . . . **Dick Smith** has entered medical practice in Hagerstown, Md., according to a news clipping that recently came my way. Dick studied medicine at Johns Hopkins University and was awarded the Army Commendation Medal at the Army Hospital in Fort Belvoir, Va., after two years in military service. He and his wife have three children.

Leesona-Moos Laboratories, a division of Leesona Corporation, recently appointed **Bill Alcorn** Program Manager for secondary zinc-air battery development. Bill joined Leesona-Moos in 1966 and has been in charge of the research program on the internal-reforming hydrocarbon fuel cell. Previously, he had been associated with Northern Research and Engineering Corporation, Cambridge, Mass., where he was engaged in engineering design projects involving heat transfer, combustion-chamber design and environmental control. . . . **Norman Heathorn** has been named to a four-year term with the Contractors State License Board in California. Norman is a Vice President with N. V. Heathorn, Inc., mechanical contractors, in Oakland.

A press clipping dated March 13, 1968, indicated that **Philip Cammack** was running for the U.S. Senate from California. Philip lives in Santa Monica. After leaving M.I.T., he worked as a consulting engineer on atomic submarines but now works for Hughes Aircraft on various new helicopter developments. I'm trying to follow this up and find out the outcome of his candidacy.

**Russell Mallett** received his M.S. in engineering mechanics from Stanford in June, 1966. He is now studying for his Ph.D. in mathematics at M.I.T. Russell's second child was born in August of 1967.

**Paul Carr** and an associate recently received the Marcus D. O'Day Memorial Award from Air Force Cambridge Research Laboratories. The award is given annually for the outstanding research achievement published by an AFCRL scientist in a recognized scientific journal during the preceding year. Paul received the award for his co-authorship of "Microwave Rectification Using Piezoelectric Quartz and Zinc Oxide," published in the December, 1967 issue of the *Journal of Applied Physics*. This paper was selected from 140 published by AFCRL scientists during 1967.

Norman Lerner recently dropped me a note to say that he received his Ph.D. in mathematical economics from American University in June and has accepted a position as Deputy Director, Command Systems Division of Communications and Systems, Inc., a computer science company in Falls Church, Va.

**Joe Leitgeb**, writing from India, advises that he has completed his assignment with Coromandel Fertilisers, Ltd., in Vizagapatam, India as Process Engineering Manager. He was loaned to Coromandel by Standard Oil of California. He adds, "The tour of duty here in India gave me an opportunity to recruit for Coromandel at various technological institutions. Their schools have much progress to make."

Recent visitors to London were **Bill** and **Ann Brandon**. Bill was here for an I.E.E.E. gathering for which he had written a paper. . . . As promised in an earlier column, I looked up **Arthur Aznavorian** when in Holland recently. The photograph included here shows, from right to left: Arthur; Susan Aznavorian, my wife, Betty, and yours truly. We had just finished visiting the small but excellent museum shown in the background, the Paltre House, in Oldenzaal. Arthur and Susan are enthusiastic their stay in Holland. In addition to working for Polaroid, Arthur is raising (in a scientific fashion) sweet corn. . . . That's all for now. A Merry Christmas and a Happy New Year to you all!—**Frederick L. Morefield**, Secretary, 18 Whaddon House, William Mews, London, SW1, England.

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Here is a late report. The reunion weekend at Provincetown was an active—who said everyone over thirty was sedentary?—and successful one; we had perfect weather all weekend. A good turnout of nearly 110 people renewed acquaintances and saw old friends. On Friday night, a folk singing group—four guys and a gal—got everybody singing along;



they were just great. The dunes-buggy tours were popular and gave us all a chance to be amateur naturalists or at least to star in "Barefoot in the Dunes." Our Saturday night banquet with broiled live lobster and steak entrees was the high point of the excellent meals served all weekend. Dancing that night, to another dance band, proved to be the undoing of some of the activists who played in the golf or tennis matches, had swum in the ocean and had taken the twelve-mile bike tour, but, happily, there were no alarm clocks for Sunday morning. After a buffet lunch on Sunday it was time to get back on that world which, for this weekend at least, we had stopped, had gotten off and, in the renewal of friendships, had vowed to make a better place.

The results of the class questionnaire are being completed as I write this column and hopefully will be in the mail to you by this time. In the meantime, here is the list of people who attended the reunion. **Bob** and **Jean Cooper**, **Pete** and **Marilyn Peterson**, **Joan** and **Harry Weintrob**, **Jim** and **Sharlyn French**, **Dale Dukes**, **Alan** and **Rosemary Hurkamp**, **Sheila** and **Bernie Schneiderman**, **Howard** and **Wendy Shawn**, **Glenn** and **Kathie Strehle**, **Milt** and **Muriel Jones**, **Bob** and **Beth Phinney**, **Bob** and **Chesley Logcher**, **Larry** and **Mary Alice Ogden**, **Carol** and **Freeman Shepherd**.

**Adeline** and **Albert Brand**, **John** and **Rena Frankle**, **Ed** and **Kathy Sullivan**, **Dick** and **Judy Wick**, **Mike** and **Jean Brose**, **Larry** and **Pat Boedeker**, **Bill** and **Barbara Bayer**, **Ed** and **Ann Newton**, **Bob** and **Phyllis Schwartz**, **Sandy** and **Marge Nobel**, **Joe** and **Judy Mulloney**, **Dick** and **Dittie Shaffer**, **Alan** and **Diane Marcovitz**, **Pete** and **Karol Hellsten**, **Karl** and **Sharon Ludwig**, **Bernd** and **Mary Gunther**, **Gary** and **Bebe Fallick**, **Jim** and **Ann Graham**, **Steve** and **Tina Hadjiyannis**, **Bob** and **Maryanne Jones**, **Ed** and **Veronica Vinarub**, **Ed** and **Marilyn Jones**, **Bob** and **Bet Ricci**, **Mark** and **Barbara D'Andrea**, **Dick** and **Pat Rosenthal**.

**Dick Barone** and **Kay Brennan**, **Frank** and **Janice Tahmoush**, **Stephen** and **Tanja Dorsey**, **Al** and **Beth Russell**, **Dave** and **Thelma Bold**, **Bob** and **Carol Lee**, **Roy Thorpe**, **Ralph Schinzel**, **Martha** and **Bob Rose**, **Maguerite** and **Pete Lynch**, **Carol** and **Willy Sander**, **Dan** and **Erika Brand**, **John Boynton** and **Jean Sue Brubaker**, **Jim** and **Sharen Benenson**. To those of you who did not attend the reunion, we hope that you will plan to be there for the fifteenth.

And now we go to more recent news. **Peter Lenn** has moved out to the San Francisco Bay area and opened a consulting firm specializing in computer-assisted analysis of technical and business problems. The name of his company is American Analysis Corporation, located at 420 Market Street in San Francisco. . . . **Richard Dalven**

is currently a member of the technical staff at RCA Laboratories in Princeton, N.J. where his main activities are centered around semi-conductor physics.

**Harry Ross** has just recently joined Motorola Semiconductor Products Division as Manager of Manufacturing, Planning and Administration for the Sentinel Program Department. Previously, Harry was down in Dallas with Texas Instruments. . . . A short note from **Allan Bergman** tells us that he is presently Market Research Manager for the National Starch and Chemical Corporation in Plainfield, N.J. They have two children, **Caroline**, 6, and **Jeffrey**, 3.

**Kenneth Wood** is working as an Urban Design Consultant to the Housing and Development Administration of the City of New York. . . . Another Class of '58 entrepreneur—**Paul Skala** has purchased the American Tool and Gauge Company which is a machine shop specializing in the manufacture of jigs, fixtures, and special machinery. They have incorporated as a division of Skala Industries in Erie, Pa., and it looks as though we better buy stock now because there is a new conglomerate in the making. . . . **Edwin Pearson** is presently serving as House Counsel for the Cavitron Corporation in New York City. . . . **Gerald Petersen** has recently been appointed Manager of Engineering for Allis-Chalmers' Advanced Electrochemical Products Division. Some of his prior positions included Manager of Physics for General Electric's Vallecitos Atomic Laboratory and Manager of Ocean Power Systems at G.E. . . . **Herbert Johnson** graduated from Harvard Law School in June and immediately took the New York Bar Exam. He has joined the law firm of Paul, Weiss, Riskind, Wharton & Garrison in New York City. . . . **Arthur Zimmel** has started a product development consulting company specializing in new medical products which is located in the New York City area.—**Michael E. Brose**, Secretary, 1171 North Street, Walpole, Mass.; **Antonia D. Schuman**, Western Associates, 22400 Napa Street, Canoga Park, Calif.

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Don't look now, fellows, but this material between the '58 and '60 contributions is one of that rarest of all little wonders, the honest-to-goodness, genuine Class of '59 Notes. (Fanfare, please.) Who knows what random process will cause them to mysteriously appear again? Perhaps the greatest driving force will be the upcoming reunion, for which I shall gleefully beat the drums to ensure that there are enough classmates present to elect a new secretary.

Yes, friends, that once-in-a-lifetime '59 Tenth Reunion is just over the horizon, due to burst forth upon us on June 13 (Friday), 14, and 15. Under the capable leadership of **Al Bufferd**, your faithful committee (at the time of this

writing composed also of **Bill White**, **Sheldon Buck**, **Larry Bishoff**, **Leon Glicksman**, **Art Collias**, **Chuck Staples**, **Norm Miller**, **Dick Sampson**, **Pat McGovern**, and yours truly) has been busily making major decisions as to place, program, and so forth. Within the next few months, you can expect to be flooded with news and propaganda; in the meantime, THINK REUNION. Suggestions—and volunteers—will be gratefully accepted.

The news has been piling up for many moons, so let's get going. **Bob Webber** writes to tell us that he headed for Purdue after graduation, taught and did research in electrical engineering there, and received his Ph.D. in February 1965. He's been working in the aerospace industry since then, for Hughes Aircraft Company until 1966 and later for Martin Marietta where he is now. Bob and his wife have two children, **Caroline**, 10, and **Andrew**, 6. He adds that he's looking forward to the reunion—as, I hope, are many of you. . . . **Bob McAuliffe** graduated from Harvard Business School in June, 1967, and is currently in the industrial real estate business with Cabot, Cabot, and Forbes in Philadelphia. He was married in the M.I.T. Chapel last spring to **Lydia Eilbracht**, formerly of The Hague, Netherlands. . . . **Herb Priluck** is presently maintaining a construction project management consulting practice, and has recently written a book, *Practical CPM for Construction*, published by R.S. Means Company.

After nine years as an engineer in the aerospace industry, **Dave Polak** has switched to business after receiving his M.B.A. from UCLA; he is presently Staff to the Vice President of Production Operations at Northrop. . . . **Malcolm Chase** began work last January in the Special Assignments Program of Dow Chemical Company after receiving his Ph.D. in physical chemistry from Florida State. . . . Also on the degree lists was **Robert Jenkins** who earned his Ph.D. in clinical psychology from the University of Chicago. Bob is Coordinator of the Residency Research Training Program at the University of Illinois College of Medicine, Neuropsychiatric Institute, and is writing a book on statistics.

The list of those entering or already in academia is growing steadily. **Hayward Aiker** joined the ranks last July as a Professor of Political Science at M.I.T. . . . **Robert Manlove** was appointed Instructor of Geology at the City College of San Francisco in September. . . . **John Marko** is an Assistant Professor of Physics at the University of British Columbia. . . . **Paul Todd** spent a year doing research in biochemistry at Oxford under a grant from the Eleanor Roosevelt Foundation, and last August resumed work as Assistant Professor of Biophysics at Penn State. . . . Promoted to Associate Professor at the Institute in July were **Joel Brown**, biology, **Charles Crawford**, electrical engineering, and **Marvin Manheim**, civil engineering.

**Herbert Fox, '60**, Assistant Professor of aeronautics and astronautics at New York University, is one of three N.Y.U. teachers cited for outstanding achievement in their profession. He received the 1968 Lindback Foundation Award along with a \$500 honorarium. The Christian R. and Mary F. Lindback Foundation annually provides for the awards, honoring teachers under the age of 35 who have shown excellence in teaching at N.Y.U., demonstrated outstanding intellectual ability and encouraged students to pursue high standards of scholarship.



**Richard Swenson** and his wife, Eva, are both with the University of Toronto; Dick is Planning Manager at the Institute of Computer Science, and Eva is Assistant Professor in the Department of Computer Science. . . . **Ulrich Luscher** left his job as Assistant Professor of Civil Engineering at M.I.T. a year ago to join Woodward-Clyde & Associates, a nationwide firm of foundation engineers and geologists, in their Oakland, Calif., office.

Making a total switch of profession, **Ronald Collier** left engineering management to become a social worker for the County of Los Angeles; he says: "I realized after nine years and two degrees that people are more important than 'things' and that money doesn't buy everything." I admire you for your decision, Ron, but why don't you come back to Boston to try to do something about the welfare mess here?

**Jerome Schooler** writes that his wife, Eileen Shelle (stage name), is making her opera debut in Bordeaux, France next month and at Philharmonic Hall in Adriana auf Noxos in April (do you suppose she might be available for entertainment at the reunion?); he is Secretary to the Metropolitan New York Chapter of the Construction Specifications Institute. . . . **George Moss** is engaged in sonar development for the Naval Oceanographic Office; they moved from their apartment to a house "much to the delight of Mary Monica, 4, and William Joseph, 2, who are watching the back yard to see what blooms" (which dates my notes since not much blooms in Washington during December).

**John Misencik** is a metallurgical aerospace engineer with N.A.S.A. when he's not busy playing father to his eight children. . . . Speaking of children, **Dick Desper** announces that his fourth child, Richard Mark, won the New Year baby contest in Needham, Mass., last January 1. Dick was transferred last summer to the U.S. Army Materials and Mechanics Research Center in Water-

town where he is working as a research chemist. . . . **Ronald Willey** says that his Willey Optical Corporation is growing nicely in the Florida sunshine, as are his five children; he ran into **Don Tyra** at the Florida Festival last year, and they see each other now and then at the G.E. computers in Daytona Beach.

**Philip Schuler** writes from Italy that he has been working there and in Denmark in chemical process design for the past three years. . . . After leading the pilot plant operation of the continuous casting mill for U.S. Steel, **Robert Keene** has been put in charge of the production facility; he and Donna and their three children are living at their new home in Chicago heights. . . . **Hank Siltanen** is with Kaiser Insurance Division of Kaiser Industries, and has two children. . . . **Robert Cross** is with Interlake Steel at the Newport, Ky. plant; he has been with the corporation since 1961 and is presently Division Industrial Engineer.

**Robert Voigt** has been named an Outstanding Young Engineer by the Kansas Engineering Society; he is Chief Structural Engineer for the consulting firm of Schlup, Becker, and Brennan, and holds engineering licenses in both Kansas and Missouri. . . . **Gerald Katz** has been named Assistant to the Chairman of the Board and Manager of Corporate Acquisitions of Witco Chemical.

I don't know from which magazine this item was clipped, but it might be good for some arguments from our aerospace brethren (especially any that work at Boeing). In a letter to the magazine, **James Conklin** writes: To me the SST falls in much the same category as pollution; it has the same effect of demeaning the level of life for large masses of the earth's inhabitants. The only reason for its existence is the profit of a very small minority, or perhaps the national prestige. But I am not convinced that either one is worth the cumulative price that will have to be paid by society, and until I am, I must. . .

claim that stopping development of the SST (at least with government funding) is the only realistic approach." As an aero man myself, I can't but help be a little disturbed by this view being taken by so many people today. Supersonic flight, whether airline or military, is a fact of life now, and the boom is here to stay unless a way can be found to cushion it. The Air Force for years seems to have been perfectly content to sit on their haunches and pay for the damage; it wasn't until the SST program that the necessary research was seriously undertaken, Jim, and I fear that windows and ears will continue to rattle if funds should be cut. Any comments? I might as well fade out of my job in a flurry of controversy.

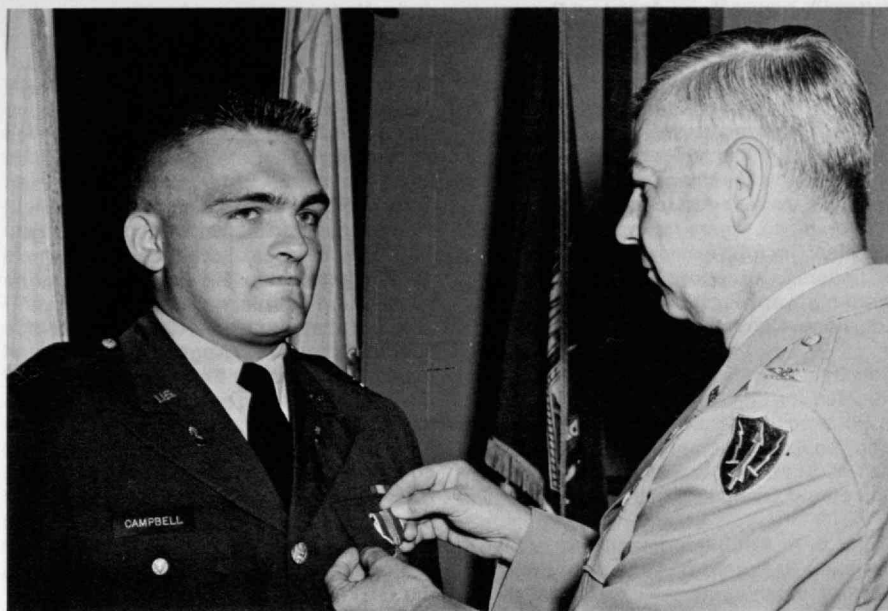
Speaking of the job, **James Hurley** writes: "Publish the notes each month, instead of every other month!!! If no news, then write about happenings at M.I.T." I absolutely agree, and consider my wrists properly slapped. Would you care to volunteer in June, Jim?—**Glenn Zeiders**, Secretary, Avco-Everett Research Lab, 2385 Revere Beach Parkway, Everett, Mass. 02149

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After talking about it endlessly, the Spragues have finally bought a house in Cambridge. We bought it on September 19 and moved in the next day. Our new address is 10 Acorn Street, Cambridge, and we're just three blocks from the Charles exactly half way between M.I.T. and the Harvard Business School, and only two blocks from where we used to live. We are totally disorganized, and no doubt will be for years to come, so any classmates who are in the area are cordially invited to drop in and enjoy the disarray.

**Bob Hudock** writes that he and his brother Phil, '62, have opened a law office in Arlington, Va. They will specialize in the Federal problems—transport-





*In early September, Captain Robert M. Campbell, '64 (left in picture), received the Army Commendation Medal for meritorious service. Coordinating programs which ultimately resulted in the application of major electronic modifications to all Region missile systems, he devised a new system of analyzing equipment statistical reports, pinpointing causes of low equipment availability with accuracy and at a speed not previously possible.*

tation, government contracts and anti-trust. Bob says that he and Phil "plan to view each problem area as a total technolegal system by utilizing a methodology developed during their association with the MITRE Corporation." . . . **Deena Koniver** wrote while flying Frontier Airlines from Las Vegas to Maryland. She was in Las Vegas for the A.C.M. conference where she ran into **Chuck Haspel**, who is with I.B.M. in Poughkeepsie. Chuck is married and has three children—two boys and a girl, and received a master's degree from Syracuse. Thanks for the report, Deena.

**Samuel Yamin** married Rebecca Winkelstein in 1965, received a Ph.D. in high energy physics from the University of Pennsylvania in 1966, and is now doing bubble chamber work at Brookhaven National Laboratory. Rebecca is getting an M.A. in anthropology at N.Y.U. . . . **Roger Townsend** married Linda Robertson on December 31, 1966, in Las Vegas. He is now working at TRW Systems, Redondo Beach, as a member of the Technical Staff, Information Systems Laboratory. . . . **Jerome Sashin** graduated from the N.Y.U. School of Medicine in 1964, interned at University of Utah Affiliated Hospitals in Salt Lake City, served two years with the U.S. Public Health Service in Washington, D.C., and is currently a second year resident in psychiatry and a Harvard Teaching Fellow at the Massachusetts Mental Health Center in Boston.

**Barton Krawetz** has been on active duty with the U.S.A.F. since January 1961. He has a master's degree in physics from USAFIT, Wright-Patterson, Ohio (1965), and is now a Research Associate at Lawrence Reed Laboratory in Livermore, Calif. He married a young lady whose name I cannot figure out from his handwriting on July 23, 1967, and is presently enrolled at a California campus, this name I also cannot decipher, for a Ph.D. in physics. (I have these small problems now and then.) . . . **John Priest**

just received a master's degree in engineering from Memphis State. He writes that "my wife, Joan, and I have an eighteen-month-old boy named John Warren. Am working in ethylene/vinyl acetate copolymers at DuPont's Schine River Works. Would like for any of my classmates on their way to Hemisfair to stop in Orange and stay with us." A generous offer, I think.

**Robert White** reports that after receiving his Ph.D. in physics from Stanford in 1964, he spent two postdoctoral years at Berkeley. In 1966 he returned to Stanford as an Assistant Professor of Physics. He and his wife Sara live in San Francisco. And, from **Robert Lagace**: "For the past four action-filled years I've been working for the consulting firm Arthur D. Little, Inc., in Cambridge. My wife, Sandy, and I still live in Arlington, Mass., and now have two children: Pamela Judith (5) and Marc Christopher (2)." . . . **George Hoag** is married to Sharyn Benek of Holland, Pa., and is working outside of Philadelphia in Fort Washington at Monitor Systems as Project Manager. He is the proud father of a baby girl named Wendy. . . . **Bruce Karnopp** has just taken a job as Assistant Professor in the Department of Engineering Mechanics at the University of Michigan at Ann Arbor.

**Ed Towbin** says: "I'm practicing architecture in Denver, managing to find time to keep up with my painting and serve as President of the Denver Artist Equity Chapter. I was one of 80 Western artists represented at a survey show at the University of Arizona, had a two-man show in Denver and have had paintings in the various shows at the art museum for the past few years. For recreation I've been picketing the Public School Administration to promote more complete integration." . . . **John Norton** is working as a naval architect for Bowker Associates of Boston; he is married to the former Cynthia Belyea of Mattapan, Mass. They have one child, Stephen

John, born on November 21, 1966. . . . **Dave Camenga** is completing his second year of residency in neurology at Barnes Hospital in St. Louis. . . . **Gordon Mutchler** finished a postdoctoral appointment at Los Alamos and is now working on a postdoctoral appointment at Rice University in Houston. . . . From **Bob Lienhard**: "After six years with Jersey Standard, most recently as Treasurer of Esso's Peruvian Affiliate in Lima, Peru, I resigned to become a management consultant with the Boston Consulting Group. Am now residing in Concord, Mass." . . . **Joseph Kappl** has "returned to school (UCLA) to work for Ph.D. in control theory (minors in computer applications and management and finance) supported by wife Pat and two children (Todd and Annmarie)." The whole family spends vacations backpacking in the high Sierras. . . . That's it for now, but watch this space next time—there's more I haven't told you about. Keep the cards and letters coming, only now please address them to: **Linda G. Sprague**, 10 Acorn Street, Cambridge, Mass. 02139

## 62

The United States Steel Corporation Research Center in Monroeville, Pa., reports that **Kenneth J. Pulkonik** participated in the 1968 Technical Summer Program. . . . A recent issue of *Forum* magazine discussed addition to a house designed by **Robert A. Mayer** and John C. Schiff. . . . Cal tech announced the awarding of doctor of philosophy degree to **Theodore W. Laetsch**, of Seward, Neb. Our congratulations to Dr. Laetsch.

**Herschel Clopper** received a Ph.D. degree at Rice Univ., Houston, Texas, June 1, 1968, with his dissertation in chemical engineering.

**Harold B. Shukovsky** writes that he is now employed at R.C.A. Laboratories, Princeton, N.J. . . . **Gerald C. Pomraning**

recently published an interesting review of *Problems and Solutions In Mathematical Physics* by Y. Choquet-Bruhat. Mr. Pomraning is a physicist with the General Dynamics Corporation. . . . **Theodore J. Sheskin** brings us up to date on his doings since graduation in 1962; he worked for IBM Components Division in Poughkeepsie, N.Y. until September, 1964, when he began fulltime attendance at Syracuse University, and received his M.S. in electrical engineering, June, 1965. Since that time he has been a Logic Design Engineer for Burroughs Corporation, Defense, Space, & Special Systems Group, Paoli, Pa.

**David Friesen**, has joined the Digital Equipment Corporation, Maynard, Mass., as a Marketing Application Analyst. Digital is the leading manufacturer of computers for use in science and research, it is reported. . . . The professional Staff of Arthur D. Little, Inc., an international industrial research and management consulting company in Cambridge, Mass., has recently been joined by **Richard Allen Brisk**. Richard will be working primarily with circuit and logic design for a variety of industrial applications.

"Project Brilliant" has brought **Robert R. Barthelemy**, project engineer for the Air Force Aero Propulsion Laboratory, Wright-Patterson AFB, Ohio, into the limelight. This is a target illumination system being developed, Barthelemy reports, so that an aircraft flying at 10,000 feet could illuminate a four square mile area 50 times brighter than moonlight. At 1,000 feet, looking 2,000 feet downrange, the illumination system will light up a one-half square mile area 500 times brighter than moonlight, and people and larger objects would be visible under the light. . . . Dr. **Richard N. Sutton**, went on active duty as Captain, U.S.A.M.C., July 10, assigned as a general surgeon at Ft. Riley, Kansas.

**Pete Canepa** writes that he is working for Raytheon in northern Italy. . . . **Leslie M. Evenchick** joined the Technical Staff of Scientific Data Systems in March, 1968.

**Wm. D. Gregg** completed his Ph.D. in electrical engineering, Purdue University, August, 1966, and then joined the University of Texas as Assistant Professor of Electrical Engineering and is doing teaching and research in his major area, communications theory and systems. . . . The National Science Foundation has awarded Oberlin College a \$22,000 grant to support the research of **James L. Powell**, Associate Professor of Geology, on the isotopic composition of strontium in alkalic igneous rocks.

**Rudolph H. Gawron, Jr.**, has taken employment with General Electric Company in Schenectady, N.Y. as manufacturing systems specialist in the Large Motor and Generator Department.

The *I.E.E. Journal of Quantum Electronics* February, 1968, published an article by M. Bass and **Jeffrey I. Steinfeld**.

Jeffrey is presently an Assistant Professor in the Department of Chemistry at M.I.T. The article, "Wavelength Dependent Time Development of the Intensity of Dye Solution Lasers," certainly demands more than amateur interest. . . . **Allan D. Pierce**, of Carlisle, Mass., is now teaching at M.I.T. . . . **Joel A. Karp** recently returned from Tokyo, Japan, where he gave MOS Integrated Circuit Seminars to Japanese engineers. Joel reports that **Stephen J. Murdoch** was married May 25, 1968 in Louisiana. Congratulations to Steve.

Commander **R. F. Burns**, was recently selected for that rank and is now working in Portsmouth Naval Shipyard preplanning groups of submarine overhauls. . . . **Dan W. Scott** is now with University Computing Company, Dallas, Texas.

**Roger E. A. Arndt** is presently an Assistant Professor of Aerospace Engineering, teaching aerodynamics and structural mechanics research in aerodynamic noise and cavitation. . . . **J. Eldon Steelman** received his Ph.D. from the University of New Mexico in June, 1968, and after a summer of vacationing in Europe, he will join the faculty at New Mexico State U. . . . Dr. **Charles E. Sparks**, now interning at New York Hospital, New York, N.Y., was graduated at the Jefferson Medical College of Philadelphia May 31, 1968. . . . **Joseph R. A. Strutt's** grandfather writes that Joe is in Switzerland, writing his thesis for his doctorate in math.—**Gerald L. Katell**, Secretary, 310 Hoge Building, Seattle, Wash. 98104

## 64

As of this writing I have completely exhausted my backlog of news. Fresh infusions are desperately needed and are guaranteed to be published, so let me hear from all of you. Now for the news: **Joe Boling** is serving in Vietnam, and is expected back around Christmas. **Gerald Burnett** is presently working on his Ph.D. at Princeton. He is co-author of an article which appeared in the May, 1968 issue of an I.E.E.E. publication on computer systems for advanced space missions. . . . **Ronald Chorba** is finishing his Ph.D. work in business administration and systems engineering at the University of Arizona.

**Frank Darmory** is working as Senior Research Chemist at Olin in New Haven, Conn., after receiving his Ph.D. at Columbia. . . . **Eugene Grumer** is the proud father of a baby girl, Sandra Kay.

**Paul Holland** has joined the firm of Richardson & Holland in Seattle. He previously worked in New York as a chemical engineer and then for the Public Health Service. His father is the firm's president. . . . **Joseph Hollweg** was married in California on June 22, of this year, and is now spending a year at the Max Planck Institute in Germany. . . . **Roger Hybels** received his M.D. at the University of Michigan this

June. He is interning at St. Joseph Mercy Hospital in Ann Arbor. . . . **Young Kwon, S.M.**, has joined the Dow Chemical Company in Midland, Mich., and is doing research in plastics. . . . Robert Lennox received his M.D. for the University of Vermont this May.

**John McFarland** is pursuing his Ph.D. in economics at Johns Hopkins. . . . **George Olah** is a member of the technical staff at TRW in Houston. His second daughter was born in February. . . . **Joseph O'Neil** is the pilot of an AC-47 Dragonship in Vietnam. An August, 1968, bulletin from the Air Force noted that the Major has been involved in combat missions. . . . **Larry Rabiner** is working for Bell Labs in New Jersey. He was co-author of a March, 1968, article appearing in an I.E.E.E. publication which discussed digital and analog formant synthesizers. . . . **Mark Radwin** is a senior scientist in information sciences at the Lockheed Palo Alto Research Labs. He lost his independence on Independence Day this year when he married the former Miss Karen Landsman of Chicago.

**Ronald Randall** has left the Army and has begun his career in educational technology. . . . **Donald Siefkes** has completed two and one-half years in the Peace Corps in Chile. He and his wife now live in Atlanta, where he is a technical representative in the southern sales area for Rohm and Haas Company, a chemicals manufacturer. . . . **Fred Silverstein** has channeled his love of the stock market into the entrepreneurial venture of becoming a securities analyst. He is publishing 10 or 12 investment recommendations a year at a subscription price of \$48.00. His first recommendation in July of this year was a certain meat packer in the Midwest who has risen \$10 per share as of this writing (September 12). If you are interested in further information, Fred can be reached c/o Cambridge Report, P. O. Box 61, Cambridge, Mass.

**Richard Stimets** is working on his Ph.D. in solid state physics at the National Magnet Lab. . . . **Jay Tenenbaum** has passed his Ph.D. orals at Stanford and is doing research in artificial intelligence and management information systems. Jay recalls his UAP candidacy days and is still prepared to take a stand on the irritating and sensitive issue of the Springfield oval. . . . **David Wolfson** is now serving as an Air Force weapons controller at Okinawa. He holds the rank of second lieutenant. . . . And last, but hopefully not least, I wish to announce that on September 4, I became the father of an eight pound five ounce baby girl. As I now retire to warm the 2 a.m. bottle, my two fondest wishes are for sleep and for an outpouring of future class news from all my classmates.—**Ron Gilman**, 1021 Oakmont Place, Apartment 8, Memphis, Tenn. 38107



Whenever I meet a classmate nowadays one of the first topics which comes up is how to keep out of the Army. The demise of graduate deferments seems to have had a serious effect on our class's plans. I suppose the worst part is the uncertainty of what's going to happen—everyone seems about to have a physical, a few have 1A classifications, yet I haven't heard of anyone who has actually been drafted yet. I would like to hear from members of the Class about their experiences with Selective Service. At M.I.T. five-year programs seem to be very popular this year and many members of the Class did not receive degrees last June, but intend to receive two degrees in June, 1969. (These people have to tell the Alumni Association that they wish to be affiliated with the Class of '68.

**Ed Seykota** plans to receive S.B. degrees in courses VI and XV. He is working as a Teaching Assistant in the Sloan School while taking subjects in Course VI. He describes his situation as "taking from the rich and giving to the poor."

**Alan Guth** is still in Course VIII going for an S.B. and S.M. . . . **Paul Hyman** is teaching in the New York Public Schools at the suggestion of his draft board. He says he enjoys it but hopes to return to school next year. . . . **Paul**

**Helfgott** is in VISTA teaching retarded children in West Virginia.

**Pete and Alexa Sorant** are both working at M.I.T. and taking one course. Alexa is an "astronaut trainer" at the I Lab while Pete works for the Planning Office. One of his responsibilities has been arranging the M.I.T.-Wellesley bus . . . **Jerry Grochow** is working at Project MAC, having received an S.M. in September. He is taking one course and is also teaching some high school students in Brookline about computers. Jerry has been appointed Class Agent so you will be hearing more from him in the future. . . . **Rich Edelstein** is at the Harvard Graduate School of Education. Also at Harvard is **Tessa Orellana**, who is in the Medical School. . . . **Barry Blumenfeld** and **Barry Mitnick** are both at Columbia in the physics dept. . . . **Rick Keyes** is working for Raytheon in Bedford and **Jim Reid** is working for North American—Autonetics in California.

There was a long article in Boston *After Dark* about **Fred Camper**. After organizing the M.I.T. Film Society he dropped out of the Institute and started making underground films. He has made four films, including one for an AI Capp tv program. His major work, *Dan Potter*, is described as "a 39 minute color film featuring a young boy in the country, photographed in hundreds of largely static poses as the seasons change around him." **Jim Carlo** was married in

Boston on August 30, to the former Margaret Burner. Jim is in Course VI-A and plans to get an S.B. and S.M. in June. Muffy is in her Senior year at Simmons.

I am sad to report that **Peter Eloranta** died this Summer in a swimming accident. Pete lived at home in Needham, was active in NRSA and received his degree in Course X. I'm sure all members of the Class join me in extending our sympathy to his family.

A few words about those who received graduate degrees with our Class. **Mark Orenstein**, S.M., VI, is now working for R.C.A. Electronic Data Processing in Barrington, N.J. . . . **Kenneth Jones**, Ph.D., III, is working for 3M in St. Paul as a Research Metallurgist. . . . **David Roy**, Ph.D., has been promoted to Captain in the Army and is stationed at the U.S. Army Air Defense Training Center at Fort Bliss. . . . **A. D. Chitaley**, Sc.D., II, is now with the B.F. Goodrich Research Center, Brecksville, Ohio.

Gail and I have settled down to school life at the Institute again. She took me to the Course XXII picnic at Prof. Gyftopoulos' house in Lexington, but I had a time explaining that I wasn't in the course, just my wife. Please drop us a line so that we'll know what you and your friends are doing.—**Gail and Mike Marcus**, Eastgate—Apartment 4H, 60 Wadsworth Street, Cambridge, Mass. 02139

# Course Review

## V

**Frank Bachelor** has been promoted to associate professor of chemistry at the University of Calgary, Alberta, Canada. Frank entered M.I.T. as a candidate for the doctorate in September 1956, after completing his military service in the U. S. Army, October 1954-August 1956. He was awarded the B.S. degree, University of California-Berkeley, in 1951 and was employed by Merck and Company, Rahway, N.J., as a research chemist. On completion of his requirements for the doctorate he accepted a National Science Foundation Postdoctoral Fellowship with Professor Weygand, Director of the Institute for Organische Chemie, Technische Hochschule, Munich, Germany, and later served as a research associate at Johns Hopkins University, working with Professor White. In 1963 he accepted an assistant professorship at the University of Calgary.

**Richard F. W. Bader**, (Ph.D., physical chemistry, February 1958, Professor at McMaster University, Hamilton, Ontario) has been elected to the Chemical Institute of Canada. Dr. Bader graduated from McMaster University in 1953 with a B.Sc. in chemistry, and an M.Sc. in chemistry, 1955. He was appointed an assistant professor, University of Ottawa in 1959, after spending 1958-1959 as a postdoctoral fellow at Cambridge University, England. He was named associate professor in 1962 and in 1963 an associate professor at McMaster; in 1966 he was promoted to a professorship. A recent publication, April 1967, announced the award of the E. W. R. Steacie Fellowship by the National Research Council. The award provides an opportunity to spend two or three years of uninterrupted research in the field of his interest, physical chemistry.

The July-August issue of the *Review*, the Course V notes included a paragraph on an award to **James W. Beatty**, B.S. North Dakota Agricultural College, Ph.D. M.I.T. 1960, who was an assistant professor at Ripon College, Ripon, Wisconsin, at that time. We are pleased to learn that he has been promoted to associate professor. His research at M.I.T. was directed by Professor Amdur.

**Genille Cave-Brown Cave**, B.A. and M.A., University of British Columbia, Vancouver, B.C. 1940, entered M.I.T. September 1948 and was awarded the Ph.D. degree in June 1951. From 1941-1948 he was employed by the Department of Mines in Victoria where he was in charge of the chemical division after serving as chief analyst and assayer. In 1950 he was the recipient of the Procter & Gamble Predoctoral Fellowship. Tuition in 1950 was \$800 for the academic year; \$200 for the summer session. A recent news release informs us that, "G. C.-B. Cave promoted to Professor of Chemistry, McGill University, Montreal."

**Terry E. Haas**, B.S. 1958, Michigan State University, Ph.D., Course V., September 1963, has been named associate professor of chemistry at Tufts University, Medford, Mass. He was promoted from assistant professor. Dr. Haas held a National Science Predoctoral Fellowship at M.I.T. from September 1960 to June 1963. His field of interest was inorganic chemistry—sponsored by Professor F. Albert Cotton. . . . **John G. Jewett**, A.B. Harvard College, June 1958, Ph.D. in organic chemistry M.I.T. February 1963, has been promoted to associate professor at Ohio University, Athens, Ohio. On completion of his requirements he accepted a postdoctoral appointment with Professor V. J. Shiner at the University of Indiana, Bloomington, Ind. His doctoral program was under the direction of Professor Frederick Greene. He was awarded one of the Cabot Solar Energy Fellowships in June 1960 and the award was renewed through September 1962. . . . **Jack A. Kyger**, B.S. Yale 1935, Ph.D. physical chemistry 1939, has been appointed to the new post of Vice President and deputy general manager of Avco's Space Systems Division in Lowell, Mass. Our records are not complete but do indicate his association with Avco for at least 13 years. His research for the doctorate was under the direction of Professor Louis Harris.

**George J. Nolfi**, S.B. University of California at Berkeley, 1966, has joined the staff of Abt Associates, Inc. a consulting and research firm located in Cambridge, Mass. He has been appointed Deputy Manager of Research & Develop-

ment Planning and Technological Forecasting Service. Dr. Nolfi entered M.I.T. in 1962 and held a National Science Foundation Predoctoral Foundation Fellowship from September 1962 to June 1965. His research was under the direction of Professors F. D. Greene and Kerry Bowers. Dr. Nolfi attended Harvard University Graduate School of Public Administration as a candidate for an advanced degree in political science on completion of his requirements in chemistry at M.I.T. . . . **Charles P. Priesing**, B.S. 1952, Merrimack College, Andover, Mass., was awarded the doctorate in organic chemistry in June 1957. He was in the first class to graduate from Merrimack College. Your correspondent has been informed that Dr. Priesing has been appointed Supervisor of Environmental Engineering at American Cyanamid, Wayne, N.J. His work at M.I.T. was directed by Professor Nicholas Milas and was related to synthesis of vitamin D<sub>3</sub>.

**Robert Leonard Yoest**, B.S. Duquesne University, Pittsburgh, 1956, Ph.D. in physical chemistry, June 1964, was ordained to the priesthood on Sunday, August 25, 1968. The ordination ceremony took place in the Pontifical Basilica of St. Michael, Calle San Justo, Madrid. Dr. Yoest was awarded the License in Sacred Theology (S.Th.) from the Pontifical Lateran University, Rome, in 1957 and the Doctor of Sacred Theology (S.T.D.) in 1968. His present address is Diego de Leon, Madrid 6, Spain.—**Leicester F. Hamilton**, Correspondent, M.I.T. 4-254, Cambridge, Mass. 02139

## VI

**Frederick E. Terman**, Sc.D.'24, now Provost Emeritus of Stanford University, is renowned for his pioneering engineering accomplishments and especially for his leadership in building Stanford's outstanding program of electrical engineering education at both the undergraduate and graduate levels. Eighth in the succession of Doctors recommended by M.I.T.'s Electrical Engineering Department, his thesis dealt with the stability of power transmission systems, a field which was to reach its peak of



activity in the 1930's. Joining Stanford's Electrical Engineering Department in 1925, he rose through the ranks of Department Head, Dean of Engineering, Provost and Vice President. He was Director of Harvard's Radio Research Laboratory during the Second World War and was decorated by the governments of the United States and Great Britain. He was President of the Institute of Radio Engineers in 1941 and was the first recipient of the Education Medal of the American Institute of Electrical Engineers. He is a member of the National Academy of Sciences and was a founding member of the National Academy of Engineering. His honorary degrees, awards, committee activities and publications are too numerous to be listed here. Dr. Terman's story "The Development of an Engineering College Program" is interestingly told in the May 1968 issue of *Engineering Education*.

**John H. Howard**, S.M.'39, died July 29, 1968 at Orange, N.J. Hospital Center. While at M.I.T. he was at first Research Assistant and later Research Associate, working on rapid selection research. During the Second World War he served as Lieutenant Commander in the Navy and received the Legion of Merit. After the war he became Associate Director of Research with the Burroughs Corporation and was most recently Manager of Technical Information Services at the Singer Corporation's research center at Denville, N.J. . . . **Robert N. Smith**, S.M.'45, is President-elect of the Ohio State Medical Association and will take office in May 1969. He is also an alternate delegate of the American Medical Association House of Delegates. A Graduate of the U.S. Military Academy, he took advanced studies in aeronautics and control engineering at M.I.T. and later received the M.D. degree from the University of Nebraska College of Medicine. His medical specialty is anesthesiology.

**Emmett H. Bradley**, S.M.'50, was recently elected Vice President of the National Security Industrial Association, and organization of companies interested in Government-industry co-operation in the defense field. Mr. Bradley is President of Atlantic Corporation, a division of the Susquehanna Corporation of Alexandria, Va. He is also Chief Operating Officer and a Member of the Board of the Susquehanna Corporation. . . . **John M. Salzer**, Sc.D.'51, President and founder of Salzer Technology Enterprises (STE) of Westwood, Calif., reports, "We are finding growing awareness of the fact that a balanced evaluation of technical, marketing and financial factors is crucial to sound business decisions." To serve diverse technical specialties and to meet the needs of different investment situations, STE forms discipline-oriented or market-oriented task groups as required. Using its staff and associates, as well as affiliated companies, STE can contribute on a national basis to a wide range of situations, forming an interface between technology and investment. Before founding

his new company, Dr. Salzer was Vice President, Technology and Planning, at General Precision's Librascope Group and held senior managerial positions with TRW and Magnavox.

**G. Platt Talcott**, S.M.'51, is now Assistant Manager of Engineering for Raytheon Company's Space and Information Systems Division, Sudbury, Mass. Since joining Raytheon in 1963, he has held a series of responsible engineering management positions including Manager of Electronic Engineering, Manager of the Computer Department and Apollo Engineering Manager. Prior to his Raytheon connection, he was with Hughes Aircraft as a senior project engineer on airborne computers. He served in the Navy during World War II and the Korean conflict, holding the rank of Lieutenant. He and his wife Elizabeth enjoy the M.I.T. foreign students whom they entertain in their home on weekends.

**Gerhard L. Hollander**, E.E.'53, is President and Technical Director of Hollander Associates in Fullerton, Calif., an organization specializing in control and planning methods for military, industrial, and commercial applications. In June 1968, under his chairmanship, the Optimal Systems Planning Symposium was held in Cleveland, Ohio, sponsored by the American Automatic Control Council, the Systems Science and Cybernetics Group of the Institute of Electrical and Electronics Engineers, and the Systems Engineering Committee of the International Federation of Automatic Control. Chairman Hollander stressed the similarity of techniques described in the various presentations, even though the applications were quite diverse. Perhaps the most ambitious paper dealt with the economic planning of an entire state of the U.S.S.R. The meeting was attended by about 250 scientists from both hemispheres.

**Murray A. Ruben**, S.M. and E.E.'64, Product Development Engineer in the Digital Equipment Corporation of Maynard, Mass., attended the International Symposium on Computer Graphics held at Brunel University in Uxbridge, England, during the week of July 29, where he presented a paper and demonstrated a new computer graphic system. The following week he made a similar demonstration at the IFIP (International Federation for Information Processing) meeting in Edinburgh, Scotland. He had planned to go on a bicycle trip through Europe after the meetings, but reports of bad weather on the continent turned his attention to northern Scotland where he did some mountain climbing. Mr. Ruben received the Bachelor of Electrical Engineering degree at the City College of New York in 1962. . . . **Mark A. Orenstein**, S.M.'68, is working with a language development group at RCA Electronic Data Processing in New Jersey, according to the Tufts *Alumni Review*. He and his wife Dianne announced the arrival of a "new software package," daughter Michelle Beth on Christmas Day 1967. . . . **Norman J.**

**Zabusky**, S.M.'53, has been promoted to Head of the Plasma and Computational Physics Research Department at the Bell Telephone Laboratories, Whippany, N.J. After joining BTL in 1961, he worked in theoretical and computational physics research including studies of nonlinear wave propagation in solids and plasmas and since 1963 has been Supervisor of the Plasma Physics Research group. He received the Ph.D. degree from California Institute of Technology in 1959. In 1959-1960 he was a National Science Foundation Postdoctoral Fellow at the Max-Planck-Institute for Physics and Astrophysics in Munich, Germany. In 1960-1961 he was Visiting Research Associate in Physics at the Princeton University Plasma Physics Laboratory. In the summer of 1966 he was Director of the International School of Nonlinear Mathematics and Physics, a NATO Advanced Study Institute in Munich, Germany. He is Editor of the Physics Session Proceedings published as "Topics in Nonlinear Physics", Springer Verlag, New York, 1968. . . . **Karl L. Wildes**, Correspondent, Room 4-232, M.I.T., Cambridge, Mass. 02139

## XVI

Herewith the second bit of evidence that I am sticking to my resolve of last month, another chapter in the varied lives of our graduate student alumni. And may I repeat, some of this "news" is no longer current, so please update me. . . .

**Edward G. Buck**, '55, says: "The nine-month rush through the course was still a whirlwind I can hardly believe. Have to convince myself now and then that I really did stay that long. We came to town in a hurricane that fall of 1954, and it didn't ever slow down much." Before coming to M.I.T., Guy had spent two years on the U.S.S. Princeton, flight training, then was in Patrol Squadron 26, and from there went to Monterey and M.I.T. After the "whirlwind" here he was wounded at VX-1 in Key West as Armament Engineer, and from there to an ASW carrier-based squadron VS-32 for two years. Then followed four years in Washington with BuAer where he initiated and managed the ASW Avionic, a new program now coming to fruition as the newest and best ASW airborne system. In 1966 he became XO of the Naval Avionics Facility in Indianapolis. "This facility has done an amazing assortment of jobs over the years, and I can brag that the caliber of the professional talent here is as high or higher than any field activity I've had the pleasure of visiting or doing business with. It's hard to hold the good young ones though—industry beckons." Guy and Mrs. Guy (Bebe) have two boys, ages 13 and 7.

**Robert R. Sparacino** was with us longer than nine months, long enough to earn an Sc.D. in 1961. Bob now is director of R & D for AC Electronics, a division of General Motors headquartered in Milwaukee. "The only item you may not have heard is that GM's Defense Research Labs in Santa Barbara were made a part

of AC in 1966, and report to me in Milwaukee. It consists of about 800 employees and is involved in Oceanography and Re-entry Physics, among other things." A more recent note shows that Bob was promoted to Director of Engineering this September. Reporting to him is **Evert D. Wilmoth**, '52, who has the new position of Technical Director for systems design and engineering.

Another of our Ph.D.'s of a slightly older vintage is **Ben George Bromberg**, '47. From M.I.T. Ben went to McDonnell Aircraft in St. Louis where he was made Chief of Missile Guidance and control. In 1951 he was appointed Chief Engineer of the Missile and Engineering Division, and eight years later became Vice President of the Space and Missile Engineering Division, his present position. "I am responsible for development and testing of space craft and guided missile designs for presentation to interested parties." Since a considerable number of parties seem interested in McDonnell developments, that's quite an order. Ben, by the way, was a member of the M.I.T. Visiting Committee for this department from 1962 to 1966, which gave us several welcome opportunities to renew acquaintances.

Also with McDonnell, but this time on the West Coast, is **Hayden L. Leon**, '42, retired from the Navy as a Captain after 34 years of service. Most of his career was in Naval Aviation R & D of logistics. "As an Aeronautical Engineering Duty Officer I put to good stead my training at M.I.T. Among his posts were those of Commanding Officer of two Naval Air R & D Commands, and Aircraft Material Officer of the Atlantic Fleet. Since retiring four years ago, he has been with McDonnell as Subcontract Manager, West Coast, in the Phantom II and Gemini Programs. "May I say that my year at M.I.T. and the additional experience of attending the 34th Advance Management Program at Harvard Business School, both in Cambridge, were the highlights of my education. They gave me entree into the scientific, engineering and business communities which otherwise would have been denied me." . . . On duty in Washington as Director, Ship Installations Division (ORD-931), Naval Ordnance Systems Command Headquarters, is **George P. Pavis**, '53, now a Captain. Another Navy man with somewhat different responsibilities is Commander **Eugene R. Wells, Jr.**, '61. After M.I.T. he spent four years at Pearl Harbor where he was on two Regulus submarines and Officer in Charge of Guided Missiles Unit Ten. From there he went to San Diego as Commanding Officer of the submarine Redfish, and in July of last year came back to the East as Weapons Officer at the New London submarine base.

**Gerhardt C. Clementson** earned both a master's and a doctor's degree with us in the 1940's. After five years with the Space and Information Systems Division of North American Aviation, he joined Falcon Research and Development Company in Denver. Clem's present position

is Manager of Falcon's Technical Operations with some 85 personnel, about half of them professional. One man who has found a part of the country that evidently agrees with him is **John R. Monk**, '57, lead engineer in Boeing's 747 aerodynamics group. "Find the Northwest great for skiing and racing my 26-foot Thunderbird sloop on Lake Washington and Puget Sound." That's taking advantage of some of those much-advertised fringe benefits.

When Giannini Controls moved its headquarters from Pasadena to New York City a couple of years ago, **Thomas J. Harriman**, '43, came with them. This seems eminently logical, since Tom is Vice President for Corporation Development. Giannini makes instruments and control systems for both industrial and aerospace use, and for those of you unfamiliar with their products this brief rundown may be of interest. "From the technical point of view, our \$40 million outfit, including a double handful of M.I.T. graduates, has done some interesting work in alphanumeric display via CRT; data compression with micrologic airborne recorders; fluidics applied to light aircraft stabilization; and numerically controlled machine tools using all the latest techniques of practical digital components and modern machine design. After five years we are finally delivering monolithic silicon pressure transducers." An intriguing lineup.

Another industrialist but in a completely different field, is **Ralph W. Rawson**, '46, president of Firth Sterling, Inc., of Pittsburgh. Ralph came to us as a Navy man, and went from Cambridge to the Bureau of Ordnance in Washington. After ten years as an Aeronautical Engineering Duty Officer working on guided missile design, development, and testing, he resigned his commission to become Fansteel's Chief Engineer, working with the aeronautical industry as a material supplier. His company produces specialty steels and sintered tungsten carbides for metal cutting, metal forming, high strength, high temperature, and severe wear applications. In 1964 Ralph became President. "Throughout the 22 years since graduating from M.I.T. I have benefited immeasurably from the facts, inspiration, and academic status acquired in Cambridge." One of your most distinguished fellow alumni is **Felix Budwell Stump**, '24, Admiral, USN (Retired). His career reads like a book, and it would make a fascinating one. Prior to WW II Admiral Stump served as navigator of the old U.S.S. Lexington, exec of the U.S.S. Enterprise, and was in command of carrier squadrons and a carrier air group. At the time of Pearl Harbor he was skipper of the U.S.S. Langley and later became the first captain of the new U.S.S. Lexington. As commander of Carrier Division 24 he participated in the campaigns of Hollandia, Saipan and Guam, Leyte, Mindoro, Lingayen, and Okinawa. That all adds up to a lot of action. The post-war years saw him successively as: Chief of Naval Air

Technical Training; Commander, Aircraft Atlantic (by now he was a Vice Admiral); Commander, U.S. 2nd Fleet and NATO Striking Fleet; and Commander-in-Chief Pacific and U.S. Pacific Fleet.

In 1958 he retired, a full Admiral. Along the way he picked up just about every medal there is, from the Navy Cross with a gold star and the Silver Star Medal all the way along the line. It is unthinkable that anyone who had led such an active life would then sit back and rest on his laurels, certainly not Admiral Stump. For several years he was Chief Executive Officer and Vice Chairman of the Freedom Foundation at Valley Forge and is now a trustee, Board Chairman of Air America, Inc., and Air Asia Company, Ltd., and on the boards of various patriotic organizations and ones for the preservation of places important in American history. See what I mean about a book? . . . That winds it up for this issue, in fact for this year. May the year ahead be good to you and yours, with lots of successes and a minimum of reverses. We'll be back again next month to tell you how others are making out.

—**Professor Walter Wrigley**, Correspondent, IL3-419, M.I.T., Cambridge, Mass. 02139





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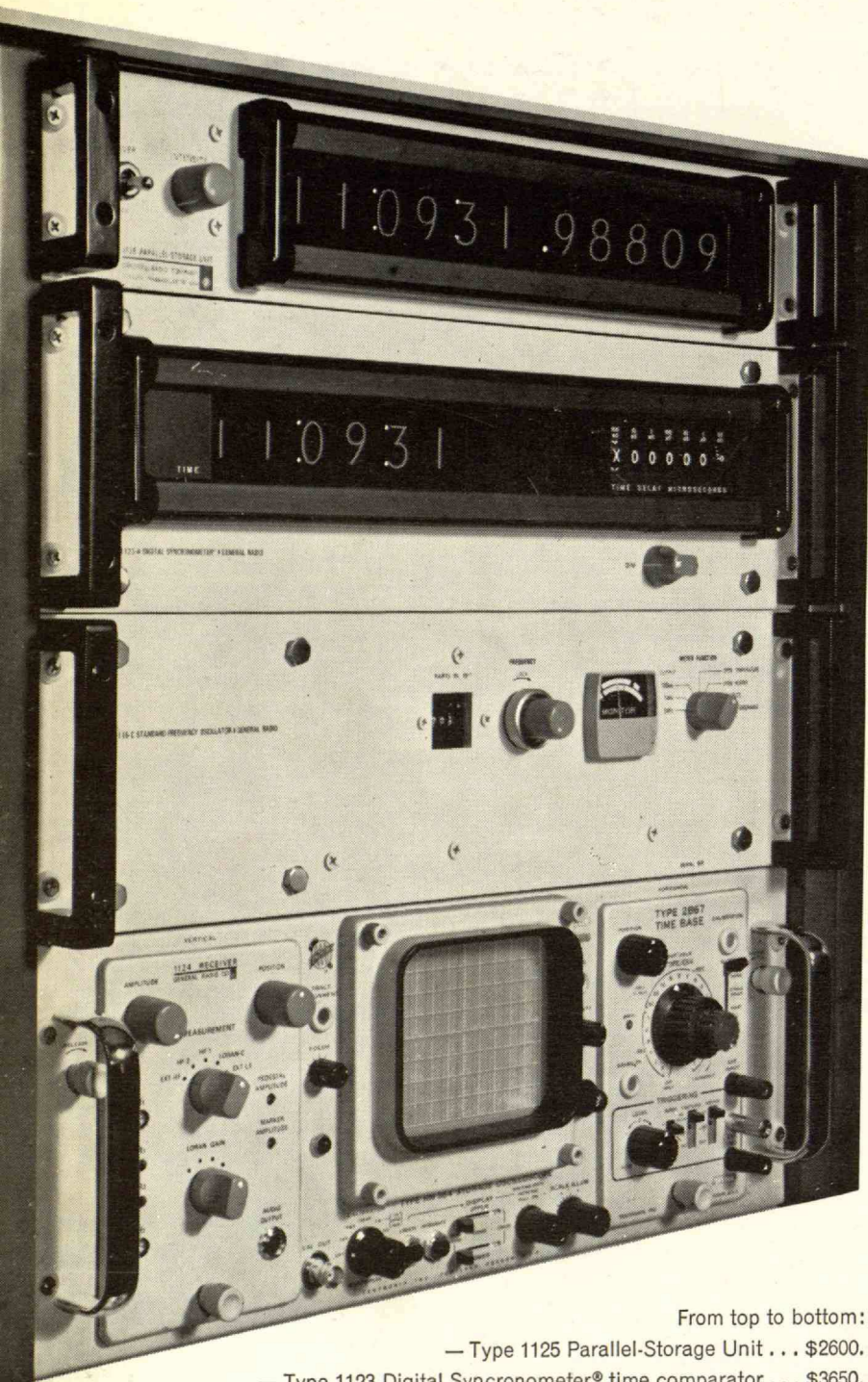
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